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VOLUME 10, NUMBER 6 • JUNE, 1954

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Humidity, temperature and shock, do not affect 3-ma output from this tiny but complex part molded by International Resistance Co. for Raytheon Co.

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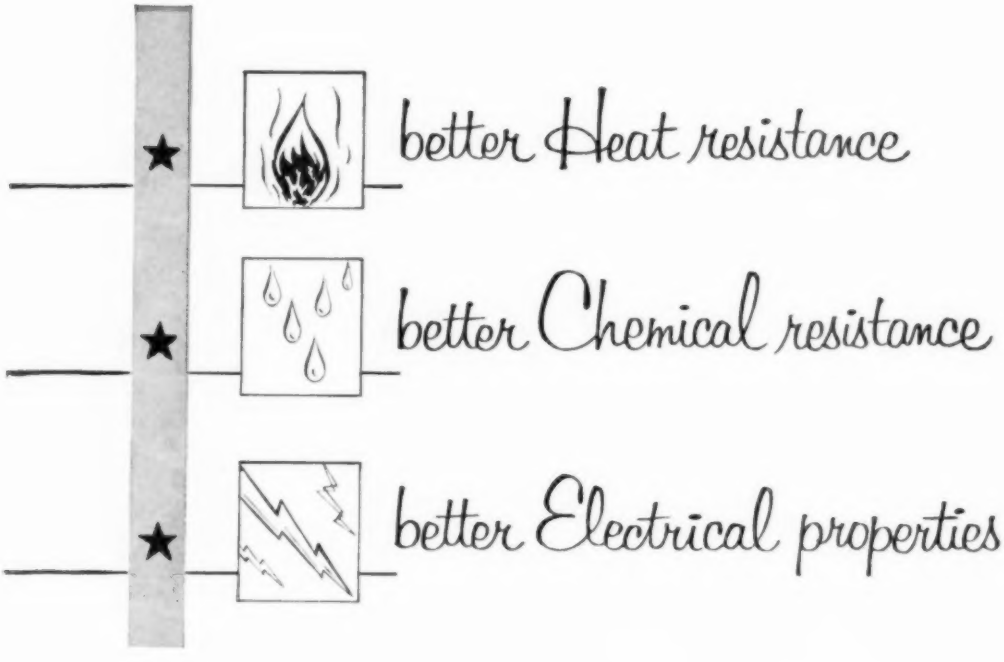
EPON® resin 828 with new Curing Agent CL gives



If you are among the many users of Epon resin 828 for casting, laminating or other structural applications—you will welcome this new development of Shell Chemical's continuing research program.

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Curing Agent CL is Shell Chemical Corporation's name for metaphenylene diamine. We do not manufacture Curing Agent CL. It is available in commercial quantities from E. I. du Pont de Nemours & Company and National Aniline Division, Allied Chemical & Dye Corp.

*A development of Shell Chemical laboratories. Patents applied for.

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All material for publication in the SPE Journal, such as manuscripts, abstracts, news releases, orders for reprints, magazines for abstracting and books for review should be directed to the Editorial Offices; Dr. Jesse H. Day, Ohio University, Athens, Ohio.

Jesse H. Day

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Dentless, seamless, resilient boat hulls, molded of General Electric polyester resins reinforced with glass fiber by Wizard Boats, Inc., Costa Mesa, California, afford an excellent example of the better boats—and better boat sales—made possible by this new plastics material. Here's how:

G-E polyester resins in Wizard boats provide a light, rugged hull that requires astonishing little care. The unusual combination of working and cured properties in G.E.'s polyesters permits single unit construction, eliminates all possibility of leaking seams or joints. And because G-E polyester resins are dependable, Wizard benefits from smooth production runs, profitable output.

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Across the Editor's Desk . . .

● Your editor, who is an addict of mystery stories when he can find the time, has a real-life mystery on his hands which only can be solved by somebody in England! And we aren't referring to Sherlock, either. But on with the mystery—a few weeks ago we got in the mail a bundle of newspapers from England, the Daily Mirror and the Chronicle and Echo. The wrapper had been lost off in the mail except for my name and address, so there was no way of knowing from whence it came. The papers were for the same week, Feb. 18-20, 1954, and I have read them in vain for some piece of news that might be of particular or personal importance. So here is the mystery. WHO sent them to me, and WHY? The papers were fun to read, and the puzzle has been fun, and all gifts are gratefully received. But it looks like the mystery won't be solved till we receive a signed and voluntary confession!

● Plastics Around the World, SPE's monthly abstracts from the world's plastics literature, would like to hear from you on the notion of extending their abstracting to include American journals and magazines. Not just the plastics magazines, but the other trade magazines which print plastics articles of interest to special groups, as we are presently doing with Electrical Manufacturing. Drop us a postcard if you like the idea, and suggest any magazine you wish us to add to our list.

● Your editor just returned from the Basic Materials Exposition in Chicago, held the week of May 17th. Most impressive of the exhibitors were the plastics companies, most of which were represented. Your editor gave a paper on "How, When and Where to Use Plastics." The audience interest and response, together with interest shown at the exhibitors' booths, pointed up very strongly that manufacturers are looking hopefully toward plastics to solve their problems. It's up to us—the molders and materials people, the whole industry—to get our story across.

● Don't overlook the notice printed on page three, or miss "Your National Office." Both tell about the removal of the National Office of SPE to Greenwich, Connecticut, so your executive-secretary can be more accessible. The SPE Journal office stays in Athens.

NEW HORIZONS IN TOOL, DIE AND MOLD WELDING

A decade of experience in Atomic-Hydrogen tool, die, mold and hob welding, plus the "know-how" of tool, die and mold makers combine to assist and advise you with your problems.

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We weld all types of tool, die and mold steel (soft, hardened, carburized or nitrided, etc.)—non-ferrous metals such as beryllium copper cavities (vacuum and pressure cast) can also be welded.

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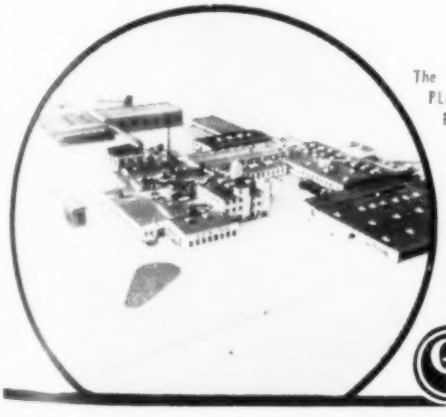

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Book Reviews . . .

TOXICITY OF INDUSTRIAL ORGANIC SOLVENTS, by E. Browning, published by the Chemical Publishing Co., 212 Fifth Ave., New York 10, N.Y. 411 pages, eight dollars.

A book on how to mold plastics and make a million dollars would be of obvious interest to the men in the plastics industry, and at first glance the book here being reviewed on the poisonous effects of solvents might not seem to have much direct bearing. It is, however, of the greatest importance that the supervisory and management personnel in any plant using solvents, be aware of the hazards.

It is a truism that familiarity breeds contempt, and the daily handling of such common materials as acetone, carbon tetrachloride, and chlorinated or oxygenated hydrocarbons can easily lead to the badly mistaken notion that these are harmless. We especially wish to make the point that because workers to not die on the job is not a necessary criterion to establish safe solvent uses. For example, "—inhalation of small amounts (of acetone) produces irritation of the upper respiratory passages and bronchi, headache, heaviness in the head, a feeling of oppression and bad dreams—". The point here is that the worker who did not sleep well, or who feels slightly ill, is not an efficient worker, and is much more likely to be involved in industrial accidents.

The book is published by the Medical Research Council of England, and is authoritative. The principal aims of the collection of data is the avoidance of poisoning from the use of solvents, and to facilitate the diagnosis of poisoning and treatment of workers exposed. J.H.D.

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DESIGN and PRODUCTION NEWS

FOR PLASTICS AND MATERIALS ENGINEERS

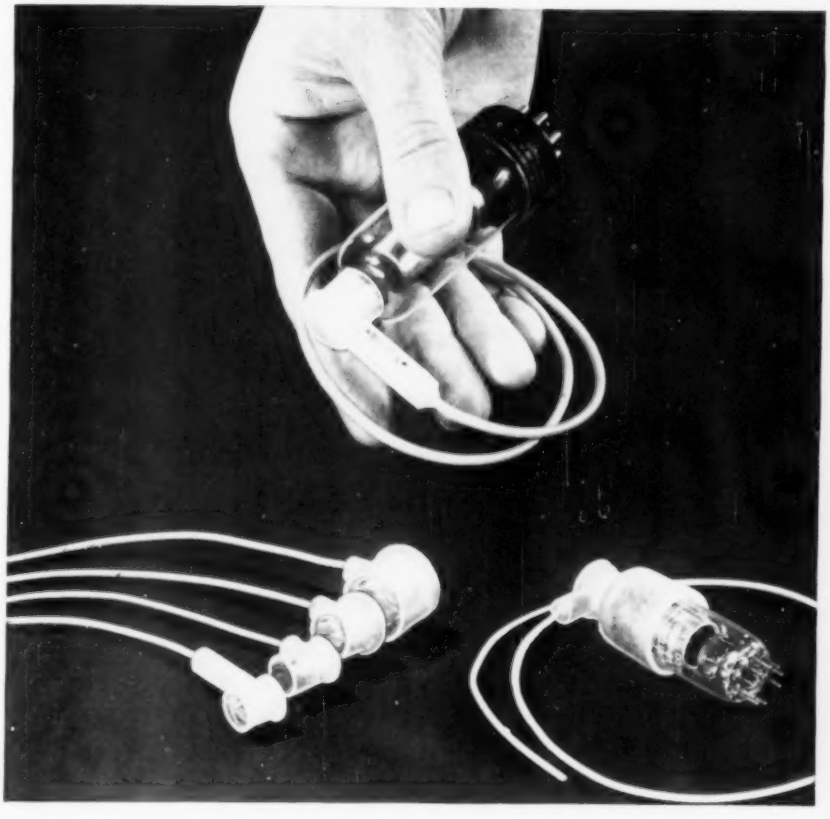
Published by TECHNICAL SERVICE, Chemical Manufacturing Division, The M. W. KELLOGG Company JUNE-JULY 1954

New Cap Connectors of KEL-F® Polymer Widen Tube Service Range!

Exceptional moldability of KEL-F polymer and special equipment permit the "insert" molding of grid cap leads and resistors into a one piece insulated jacket. Conventional wire holes are eliminated, preventing insulation "pull back". Zero moisture absorption of KEL-F polymer and the elimination of wire holes precludes moisture collection which formerly caused "arc over" under high humidity.

The high insulation resistance and dimensional stability of KEL-F polymer over a wide temperature range (minus 320°F to plus 390°F) permits use of these connectors in critical installations subjected to extremes of temperature.

Alden Products Company, Brockton, Mass., uses KEL-F trifluorochloroethylene and a special molding technique to produce an entire series of connectors. Variety includes top- or side-connected leads, with or without resistors.



For complete information regarding any item mentioned in DESIGN AND PRODUCTION NEWS, ask for detailed APPLICATION REPORTS, write

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100-1999 pounds	9.50	9.00	10.50
2000 pounds and over	9.00	8.50	10.00

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The English Mica Co. . . . of 79 Prospect Street, Stamford, Connecticut . . . has the finer grades available from 160 mesh to a theoretical 3,000 mesh.

Write The English Mica Co. . . . of 79 Prospect Street, Stamford, Connecticut for information on the Finer Ground Micas and U.S. Mica Co., Inc., Jordan & Van Dyke Streets, East Rutherford, N.J. on the coarser Ground Micas.

SECTION MEMBERSHIP COMPETITION

Goal: 5000 Members By October!

	MEMBERSHIP	NEW APPLICANTS		
	Oct. 1, 1953	Oct.-Jan.	Jan.-April	% of Goal
Baltimore-Washington	49	1	4	
Buffalo	65	5	3	
Central Ohio	33	1	2	
Chicago	315	21	13	
Cleveland-Akron	148	17	16	
Connecticut	86	4	8	
Detroit	173	13	16	
Eastern New England	132	5	13	
Golden Gate	32	5	5	
Miami Valley	102	2	3	
Milwaukee	1		12	
Newark	321	31	17	
New York	248	32	50	
Northern Indiana	21	1	4	
Northwest Pennsylvania	13	3	3	
Ontario	43	23	31	
Philadelphia	174	9	23	
Pittsburgh	6	8	5	
Quebec	25	16	11	
Rhode Island & S. E. Mass.	68	4	3	
Rochester	65	10	8	
St. Louis	71	13	6	
Southeastern Ohio	36	4	3	
Southern California	96	15	13	
Southern Section	3		13	
South Texas	32	6	7	
Toledo	59	0	1	
Upper Midwest	54	5	5	
Western New England	135	15	20	
Non-Section	33	0	8	
TOTALS	2704	267	368	

GRAND TOTAL—3339

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Deep undercuts are an important feature of its design, making a snug fit of the two parts that enclose the electrical assembly.

The material's elasticity permits the case to be stretched so that the microphone assembly can be inserted without difficulty. The cover, also made from BAKELITE Vinyl Elastomeric Plastics, but formulated to provide stiffness and semi-rigidity, is shaped to snap into place and hold fast. Surfaces have a high gloss, finely molded details.

BAKELITE Vinyl Elastomeric Plastics keep their resilience and flexibility, protecting delicate electrical components against shock during use. They have excellent dielectric properties, as well as resistance to water, acids, alkalies, oil, and grease. They withstand long, repeated flexing, and stay resilient at low temperatures. Their aging characteristics are superior.

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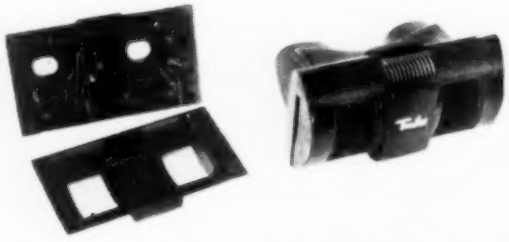

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Industry Notes

First Study of Glass Fiber Laminates For Shell Structures Published by Lunn

The first comprehensive study of glass fiber laminates for the manufacture of shell structures was made available today in a 24-page brochure just published by Lunn Laminates, Inc., custom molders of reinforced plastics. It is entitled "Glass Fiber Laminates For Shell Structures."

In detailed form, the authors, A. A. Gassner and Harry Kahn, design-engineers and consultants for Lunn, point out via equations, diagrams and charts the advantages of these laminates over metal or wood construction for shell type structures.

The brochure is available without charge from Lunn Laminates, Inc., Oakwood Road and West 11th Street, Huntington Station, Long Island, N. Y.

Symposium On Light Microscopy

Published by A.S.T.M., 1916 Race St., Philadelphia
Paper-bound, $2.50, 132 pages.

The papers in this Symposium, presented at the 55th Annual Meeting of the American Society for Testing Materials held in New York on June, 1952, are representative of the applications of the microscope as a technical tool in a number of fields and the techniques of its use. Although the literature cites applications other than biological in the early eighteenth century, microscopy from an engineering, industrial, and research standpoint has made its greatest strides through the last three decades. Besides the direct users of microscopy there are many others who benefit from its findings and who in their scientific and engineering reasoning continually make use of concepts and phenomena largely founded on visual evidence from basic microscopical investigations. As an educational tool the microscope can contribute greatly to the training of all engineers by revealing the variations and importance of structure in the materials they use.

The purpose of this Symposium was to bring together people interested in the various phases of this important field and present the results of more recent advancements.

There is a wealth of pictorial examples throughout this book, and it will prove a valuable addition to any research engineer's library. Several of the papers have excellent lists of references.

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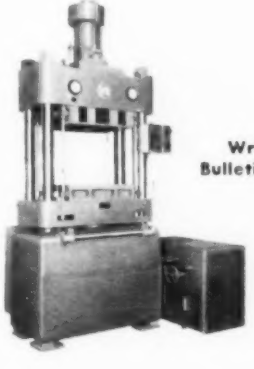

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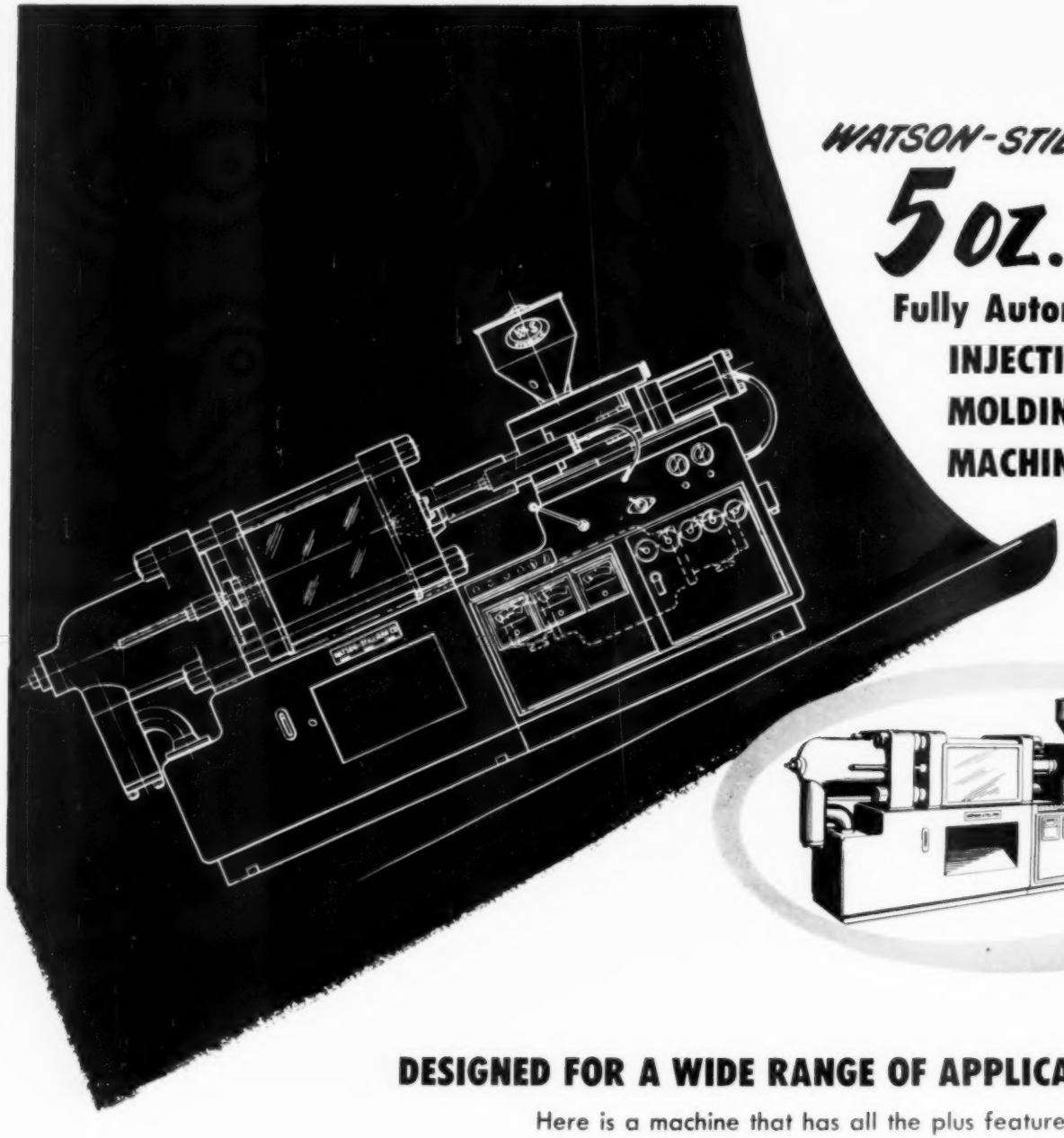

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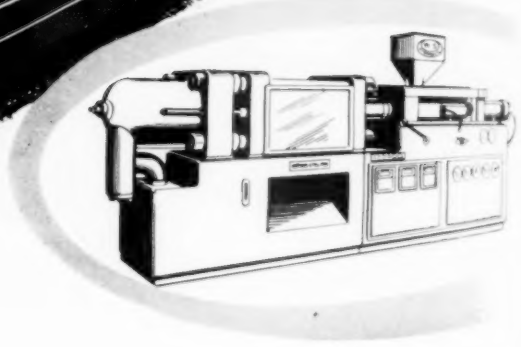

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UNTIL SEPTEMBER

Although plans are to place the JOURNAL on a full twelve month publishing schedule next year; this year the June issue will be the last one, as in previous years, until the Fall.

Before signing off for the summer let's take a quick look at this June JOURNAL for evidence of the increasing success of your Society. **Ninety-two pages in size, it is the largest JOURNAL ever published!** Your name with your company affiliation is printed in its pages. Approximately 5,000 people will read it!

With total membership as of April 30 over 3,300, the membership roster in this issue lists about 1,000 more members than last year. **Three new sections** are added to our rolls: Pittsburgh, Milwaukee, and Southern. Next year in addition to several more sections in North America, a section overseas should be listed for the first time in our history.

YOU see, this June JOURNAL is really a barometer of each year of the Society's progress. It has gone in only one direction—up!

Your National Office has had to move to larger quarters and has been relocated to a more accessible spot. With a staff of four we are now utilizing 1,000 square feet of office and file space in Suite 116-118 at 34 East Putnam Avenue, Greenwich, Connecticut. The telephone number is Greenwich 8-5617. By train it is 45 minutes from Grand Central Station, New York City and by car it is one hour from New York City on the Merritt Parkway. Your staff will be delighted to see you anytime you are within striking range. Perhaps if you are traveling in the area this summer, you will stop in.

The National Office of course operates year round and so does most of the National Organization. **Work is well underway on the Eleventh Annual Technical Conference to be held in Atlantic City, New Jersey, in January.** The National Conference Committee will be working right through the summer months as will the National Professional Activities Committee, Technical Advisory Committee and Education Committee.

You will be hearing from the National Office too since **the July 1-June 30, 1955 dues payment notices will be mailed to you within the next six weeks.** For all (except Junior members) the amount due will be $12 from each member, payable on receipt of notice. But why wait until you receive the bill? Why not send your check for $12 right away to

Society of Plastics Engineers, Inc.
Suite 116-118
34 East Putnam Ave.
Greenwich, Connecticut.

Please do not delay the mailing of this payment, necessitating sending of additional notices. Second and third notices are wasteful in that they make stationery suppliers and Uncle Sam's Post Office richer and deprive the Society of additional funds.

The Sections are urged to catch up on the processing of applications over the summer months. **And while Society activities on the local level slow down during the summer, let's not take any vacation from getting new members!**

Your staff wishes you a most pleasant summer and look forward to your visiting us.

Sincerely,

P. I. Underwood

Executive Secretary

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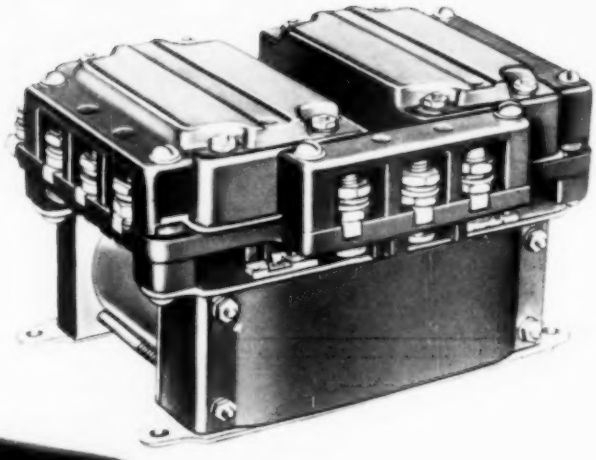

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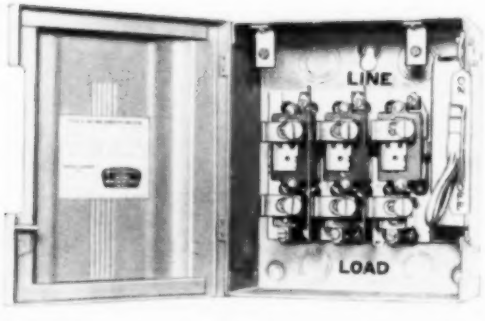

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extrusion die design

H. O. Corbett

Auburn Button Works, Inc.
Auburn, N.Y.

The very nature of the plastics industry, the immediate demand for a finished part tomorrow, so to speak, has increased the burden placed upon the extrusion engineer. Since very little formal schooling can be offered a new prospect and the many extrusion theories are as varied as the individuals expounding them, a simplified, more direct approach to the problems involved with custom shape extrusions has been proven to be the most efficient manner to accomplish a reliable trend for design.

IN order to operate a large extrusion plant, say eight or more extrusion machines, twenty four hours a day, extruding both cellulosics and vinyls into virtually any shape, the extrusion engineer is confronted with several acute, yet obvious problems. First are the machines themselves. Invariably the selection has already been made by someone else. If a new prospective engineer progresses until he reaches the position, he may be responsible for the selection of new and perhaps, other machinery to enlarge the plant. He must, therefore, have a pretty good idea at this time what he does or does not want.

EXTRUSION MACHINERY

What about the extrusion machine? Which is better —an oil or an electrically heated machine? Seldom can this question be asked in the presence of other successful extrusion engineers without starting an argument which seldom concludes in any other way than each engineer fighting for the particular type of equipment he has to work with. In my opinion, there is no appreciable difference for run of the mill operations. We at Auburn have both types and both perform with equal versatility. Electrically heated extruders usually require less floor space and are by nature cleaner. Old timers will tell you that nothing heats more evenly than the transfer of heat through oil as a medium. Heat can be reduced more rapidly if need be, ambient or frictional heat build-up can be controlled better, yet modern electric machines have blowers or direct cooling by cored chambers for the same purpose and they work. Electrically heated extruders are a necessity when the extrusion temperature of a particular material exceeds the flash point of the transfer oil. They are just as easy to keep in top notch operating order and are much less difficult to trouble-shoot and repair if difficulty should be experienced with the heating systems.

Upon recommending a particular type of machine for purchase, the engineer is naturally confronted with the resultant cost. From the original equipment manufacturer, both designs have very little to offer as a decisive advantage; which brings up the question of a machine drive, the next costly and sometimes most costly part of the purchase. At this point the argumentive engineers seem to have more in common; the actual cost versus trouble free performance being the main topic for conversation. The direct current variable speed drive is generally considered best for all around flexibility, particularly where an organization principally engages in a job shop or custom shape extrusion type of business. Where an extrusion concern produces a single type of extruded product such as large sheeting, film, pipe, and the like, it is generally conceded that a less flexible drive is most satisfactory. Any advantage a stepless drive may have is hardly noticed for this type of extrusion; as a matter of fact there is a decided advantage because one of the many variables has been eliminated. A real saving is apparent whenever it is possible to drive an extruder with nothing other than a motor and a four or six stage gear box. Such drives are very dependable and usually operate more trouble-free than any other kind. Here again the many pros and cons provide food for real discussion. One operator may say, "It doesn't seem logical for me to mix machine drives. I've got three machines all oil heated and equipped with D. C. variable speed drives. Why should I even think of having so many different components and have the headache of servicing such a variety of equipment?"

INTERCHANGEABLE COMPONENTS

Interchangeability of machine components certainly has an advantage, yet few companies carry spare parts of sufficient range to consider themselves immediately serviceable from their own stock. Yes, we all carry spare rectifying tubes, brushes, contacts, oil pumps and spare oil immersion heaters, but who stocks a spare 40 H. P. drive or a complete spare oil heating unit? We all depend primarily upon prompt factory service both for the ex-

truder and its accessories. Therefore, it is left to the extrusion engineer to recommend as he analyzes his own present and future programs. There is no substitute for good sound practical experience, yet such experience should not paralyze progressive thinking. The old statement, "Listen, sonny, this is the way we have been doing things around here for the past 20 years. We've never had any trouble before so why ask for it?", has no place in modern day engineering. The fear of assuming responsibility has contributed to the gradual decline of many progressive organizations.

Whenever an extrusion plant becomes large enough to take on very large extrusion projects where certain equipment may be required to accomplish this end, it is advisable to select equipment of a specific nature, designed for this single purpose. Machinery costs are fabulous for today. Any business man must give prime consideration to the cost of capital equipment and in any case it behooves the engineer to think in this manner also.

RESEARCH NEEDED

Research to obtain good basic design in tooling an extruder for production can be considered to be the most important phase for the operation of a successful extrusion plant. Not unlike baseball an extrusion engineer has three chances: the extrusion machine, the compounded material and the tools. Failure to produce in any one of these strike zones can be responsible for complete failure. Any modern day extrusion machine will do a good job if properly maintained. If your plant is fortunate enough to maintain its own experimental laboratory, well staffed, as it is in Auburn, and the very closest cooperation is maintained between engineering and chemistry, most any problem can be worked out. However, if not, there is lots of service and outside advice when it comes to obtaining good vinyl compounds, even to very rigid specifications, but advice for good tooling can be a severe third strike. Many extruders quote shape vinyl extrusions no die charge—others, very little. Delivery in this business must be fast and service, quality and standards near perfect. Bulky and costly designs only prove more costly. Lack of interchangeability in design hampers delivery, machine experience and seriously affects production scheduling. Lack of simplicity generally causes havoc, culminating in the engineer having to start and get nearly every job going himself.

Non-adjustable tooling is almost the same as being up the creek without a paddle should the die not work! Under these circumstances the engineer may suffer what can be called an "engineering relapse." Under the pressure of demanded production he breaks down, throws logic to the winds and starts to work on the die himself, filing, off-hand grinding and otherwise altering the orifice and rear approach passages. This may ultimately result in the desired section being obtained. He has learned nothing, wasted his own and his company's time and should that particular die be misplaced between customers' orders, there is nothing on hand to remember its peculiarities, so he has to start all over again.

The situation you have just heard is true; only the names of the characters have been omitted.

THE EXTRUSION MACHINE

From the breaker plate forward is where we begin. Most extrusion machines come equipped with a so-called "Swing Gate." This is good, leave it alone except:

1. It should be heated.
2. Hinge pin should be a loose fit.
3. It should swing freely and be maintained so it will line up easily.

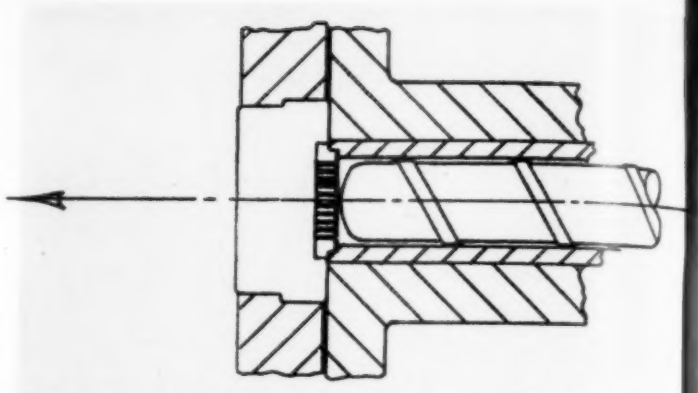


Figure 1. Schematic section of extruder barrel with swing gate closed, showing a basic die blank.

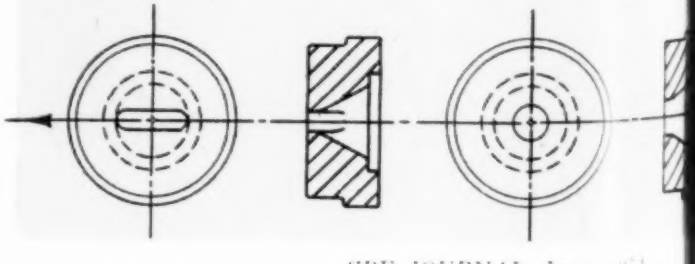
At this point controversy in design commences. I shall not discuss all of the many varying alternates comprising a good design, rather I will show a good basic system. This arrangement really works and may concur with your own systems or ideas.

In Figure 1 is illustrated in schematic section an extruder barrel with the swing gate closed showing a basic die blank or die base, securely locked in position and in turn clamping the breaker plate against its shoulder, thereby preventing any leakage. Incidentally, if a breaker plate should bottom out on the screen pack, excessive leakage could occur, which might give someone the impression that the gate is sprung or the die base is not seating properly. This head design is most common and is standard as supplied by many machine manufacturers.

Now, should each particular shape be custom approached? Should a design be absolutely streamlined from this point to the orifice? The answer is **no.** Of course, there should be no back eddies or trapping corners, but real economy and inexpensive design is dependent upon not having to have fluid-like flowing compound-curvatures to the orifice. One should simply consider, "What basic shape or shapes will satisfy most extruded sections?" Here is our conclusion:

Figure 2 shows two die bases with two approaching passages, identical except one winds up a circle, the other as an elongated slot. Other than about three dimensional variations of the hole and the slot for each, this is all that is necessary for a good approach to nearly anything, and yet more important, as we shall see, it acts as a completely interchangeable permanent type of die base. Many of you may be thinking at this point as to how this die base or die holder system lends itself to the design of a set of tube dies or other cored and more complicated shapes. The answer is—very well. However, for now, I want to illustrate this simple arrangement for the extrusion of solid sections such as tapes, rods or any ir-

Figure 2. Die bases with well-designed approaches to slot die and circular die.



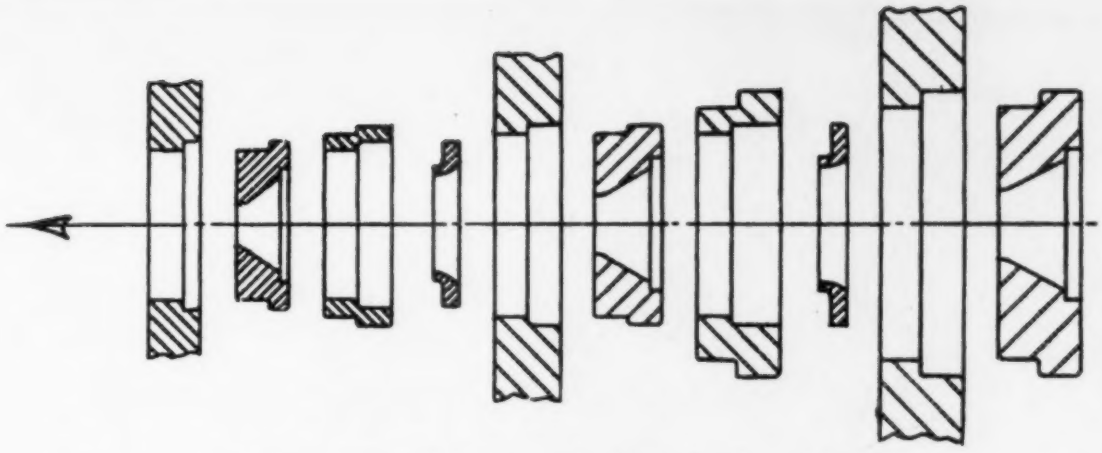


Figure 3. This set of die bases and adapter rings illustrates how one die may be used on several different size extrusion machines. This interchangeability is important to efficient tooling.

regular solid shape to its completion before progressing into more intricate cored shapes. "What's so hot about that approach shape?", one might ask. The answer is its cost and the fact that it can be made in its entirety in the most simple of machine shops. Any number are interchangeable since they are identical and there is the underlying thought that suggests the opportunity of being able to duplicate what one has previously accomplished.

THE ADAPTER RING

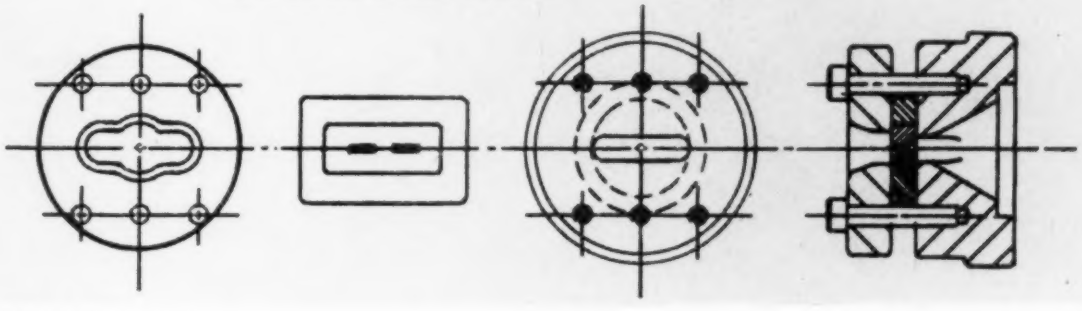
Now we are ready to introduce the first and most useful auxiliary tool: the adapter ring. It is well to note at this time that this type of die base must be designed to accommodate the maximum capacity of each particular size of extrusion machine, but each die base must be adaptable to any size larger machine than the one it has been designed to fit directly into. Therefore a standard $2\frac{1}{2}$ inch die base with an adapter ring will fit a $3\frac{1}{2}$ inch and a $3\frac{1}{2}$ inch die base with an adapter ring will fit a $4\frac{1}{2}$ inch, yet the $2\frac{1}{2}$ inch die base by using both adapter rings will fit directly into a $4\frac{1}{2}$ inch. Now we are able to operate any set of tools in any machine, which enables selectivity for most efficient operation and emergency scheduling. This is nothing to make a big issue of and one set of adapter rings is most generally enough, two would take care of most any circumstance.

Now for the actual orifice. Since our die is to be made from common flat-ground stock we shall call it a plate die, and it is to be mounted in the following manner. Our object is to extrude simple tape, double or triple orifice.

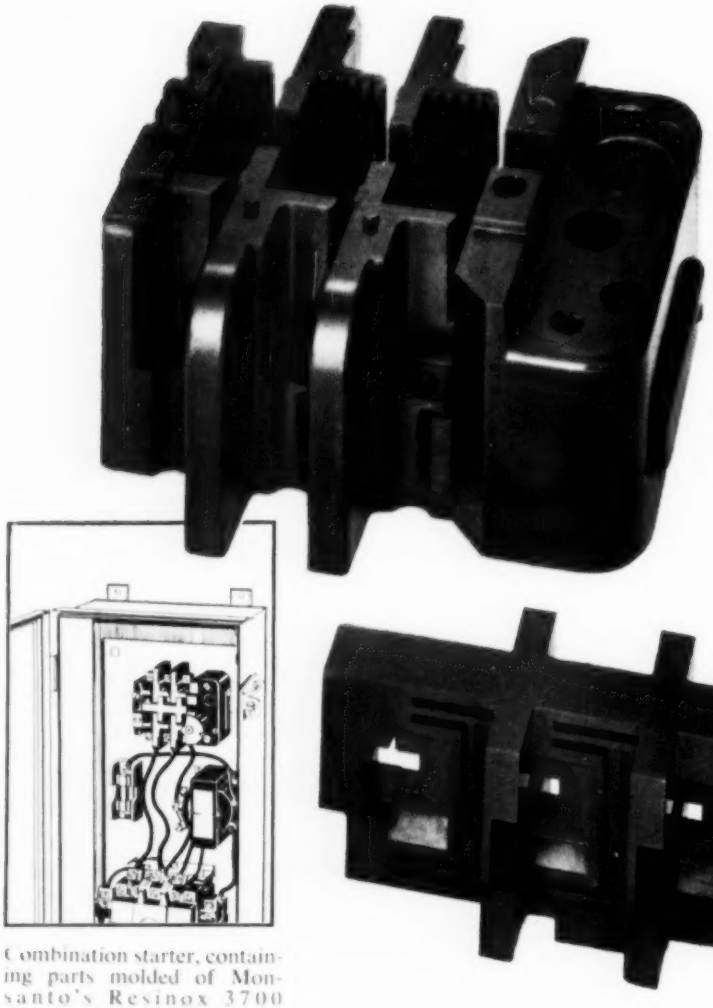
First the die base is drilled and tapped with a set of holes standardized for all $2\frac{1}{2}$ inch die bases of this type. Since previous experience indicates that tapes run well either on a $2\frac{1}{2}$ inch or a $3\frac{1}{2}$ inch we decide to make up a standard $2\frac{1}{2}$ inch split type plate die. This plate die design is also interchangeable with the split plate die design for the $3\frac{1}{2}$'s. There is nothing else to consider because the complete tooling could fit in each machine if need be. For the die base—approach combination we have selected the narrowest slot-type of standard die base, the width of the slot being, say, $\frac{1}{2}$ inch. One might point out, "That arrangement isn't streamline! You are approaching into a dead wall against the die plate!" This is correct, which brings about another point in the extrusion of thermoplastics. Any die orifice machined to say 20% greater dimensions than the desired finished section size, with uniformity of section, that is same wall thickness throughout, should result in a perfect extrusion the first trial, if approached in this manner. Contrary to the general belief, burning of material will not be experienced if the above approaching method is not ridiculously over-emphasized. In my opinion it is imperative that dies not be designed as one big venturi. A venturi is a restricting orifice so designed as to increase the rate of fluid flow thereby proportionately reducing the pressure of the same fluid at the points of restriction. There is part of your answer. Dies designed in this manner generally pitch curves, resulting in a near impossible correction diagnosis for the extrusion engineer. It is virtually impossible to balance the flow from a dual orifice under these conditions. You see, when the thermoplastic compound is plasticized and becomes a semi-fluid mixture at this state, it behaves in the same manner as any other fluid passing through a venturi-like shape. Being fluid it wants to re-

(please turn to page 84)

Figure 4. Good design for a double-orifice die for extrusion of tape, with non-streamline approach.



How would you handle this electrical parts problem?



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FORUM

on the education of the plastics engineer

Robert C. Bartlett

H. A. Gadd

C. C. Winding

1 Present status of education in the field of high ploymers

2 Industrial interest in education of plastics engineer

3 Future growth of the Plastics industry

4 The college view of a Plastics Education

An expanding industry needs a supply of adequately trained engineers. To date the plastics industry has trained its own men. Real impetus in growth and quality would result if colleges could turn out engineers with a real knowledge of plastics. But just what would constitute a Plastics Engineer? Who would train him? What subjects should he study? What does industry want and what can the colleges do about it?

FORUM

1 Present status of education in the field of high polymers

C. C. Winding
Cornell University
Ithaca, New York

Two investigations of the amount of instruction offered by universities in the field of high polymers in general have been made by the S.P.E. Education Committee. These surveys were made two years apart, the first in 1951 and the second in 1953. Questionnaires were circulated asking for information regarding offerings involving complete courses on high polymers and courses in which only part of the time was spent on high polymers. Basic courses in organic chemistry were excluded since it was assumed that such courses would include a small but variable amount of work on polymers and polymerization processes. A rather broad coverage was obtained since replies included courses on paints and varnishes, synthetic fibers, plastics, and rubbers. The questionnaire was purposely made all-inclusive since it was felt that we were interested in all courses relating to high polymers rather than in specific programs comprising an option or leading towards a degree.

With a few exceptions, the questionnaires were sent to universities that had accredited curricula in chemical engineering and graduate programs leading to the doctor's degree. This method of sampling was employed because such curricula should indicate the existence of strong departments in both chemistry and engineering. The 1953 survey was larger; 55 replies were received from a total list of 62 institutions; in 1951, thirty-seven out of thirty-eight replies were received.

Semester credit hours have been used to indicate the amount of instruction offered by the institutions replying to the questionnaires. Normally one semester credit approximates 15 hours of lectures or 30 to 45 hours of laboratory work. A considerable amount of estimation was necessary in evaluating the questionnaires but the relative order of magnitude of the amount of work offered is indicated. The following table summarizes the results obtained from both questionnaires:

SUMMARY OF REPLIES TO QUESTIONNAIRES

Courses on High Polymers	Institutions Offering			
	Number		Per Cent	
	1951	1953	1951	1953
More than 20 credits	4	4	11	7
Ten to 20 credits	5	5	14	9
Five to 10 credits	10	9	27	16
One to 5 credits	12	27	32	49
None	6	10	16	18
Total offering courses	31	45	84	81
Laboratory courses	14	14	38	26
In Chemical Engineering Depts	25	36	68	65
In Chemistry Departments	21	20	57	36

Increasing the number of schools contacted from 37 to 55 showed that the first survey had actually been a good sampling in that it had apparently covered those schools offering 10 credits or more involving high polymers. The number of schools in this bracket actually decreased by one in the 1953 survey. It should be noted that four schools contacted in the first survey did not reply to the second but only one of them had offered more than 10 credits in 1951.

Four schools offered 20 or more credits, indicating an option or major in polymers at the graduate level or for occasional undergraduates. Offerings in two of these institutions are principally in the chemistry department. In the other two cases, most of the courses are given by engineering departments. If this survey has been broad enough to cover all schools with considerable offerings in this field, only two universities are attempting to train men for work on polymeric materials.

Among the five schools offering 10 to 20 credits, three could readily expand their courses to cover a major in polymeric materials and one could easily do so in protective coatings.

On the basis of these surveys, I believe that we can conclude that if the demand warrants it, there are approximately half-a-dozen universities prepared to give engineers enough additional courses at the graduate level to train them for work on polymeric materials. The phrase, "if the demand warrants it," is all-important. There are indications that relatively few students are asking for additional work in this field. Very often comments such as "not offered in the past three years" or "offered only when demanded," were included after the course listings in replies to the questionnaire. There are other indications that demand originating from students enrolled in the regular university programs is not very great. It should be remembered that these surveys dealt with offerings in the regular sessions and not with extramural or night schools.

The surveys indicate that approximately two-thirds of the engineering schools are offering one or more elective engineering courses in this field. With the exception of fractional parts of courses devoted to chemical technology or non-metallic materials of construction, all of the offerings are on an elective basis. Thus, the number of students enrolled in such courses would depend on student choice, and the number of men taking such training depends entirely on this fact. In this situation, student demand is the most important single factor to be considered in attempting to expand training in the field of high polymers.

Only seven out of the 55 institutions replying indicated that they give one or more complete courses on polymeric materials in departments other than chemistry or chemical engineering.

Approximately one-fourth of the schools replying indicated that laboratory courses involving polymeric materials were being given. With a few exceptions, these laboratory courses are offered by the chemistry departments. Apparently there is very little chance that laboratory fabricating and processing equipment can be made available except in special cases. Such laboratories are, in general, too expensive for elective courses taken by a relatively small number of students.

In addition to the above factual information, I obtained several opinions and impressions in informal discussions and correspondence on this subject. Most important there is a very definite opposition to the introduction of *any required* specialized courses in undergraduate curricula. The trend is in the other direction. In fact, accrediting committees warn against specialization in curricula leading to general engineering degrees. This opposition to specialization extends into the graduate level at many institutions.

In opposition to most of the above, there are indications of a growing interest in high polymers on the part of instructional staffs. An increasing number of you

instructors have had industrial experience in the field and are working more and more subject matter involving high polymers into existing, broader courses. In addition, the amount of research is relatively great. In at least one school, 30 to 50 graduate students are engaged in high polymer research, although no formal courses are offered. Neither of these factors is apparent in a survey of this type.

2 Industrial interest in the education of plastics engineer

Robert C. Bartlett
Natvar Corp.
Woodbridge, N.J.

A previous report has been made to you on the results of an opinion poll of the plastics industry's requirements for education of plastics engineers. Industrial interest in the current Society of Plastics Engineers "Program for Professional Engineering Education in Plastics" was determined by means of a widely distributed questionnaire (1) (2). In general, the plastics industry was keenly interested in the problem of education of plastics engineers. Results of this survey reveal an overwhelming approval of the SPE educational plan. Naturally our democratic atmosphere permitted a few dissenting comments to penetrate the general picture of favorable opinion. However, statistical analysis of the returns gave an unquestionable concensus of endorsement to the SPE education plan for plastics engineers.

IT is my purpose here to avoid repetition of what has already been published and elaborate on the industrial point of view towards education in this new profession. As far as the general problem of education in plastics engineering is concerned, my position is going to be characterized as that of demand for education, while my fellow academic speakers in this forum are better qualified to elaborate on the supply picture. Comments received from individuals in the above described survey are most interesting and will aid you as well as the educators in handling this subject of education more effectively.

The main problem of education in this new profession of plastics engineering is aiming the academic gun at the industrial target. This difficulty may be well demonstrated by the following classroom story. (3) "A first-grade teacher struggled with the last pair of stubborn galoshes. Three times already that day—once in the morning and twice at noon—she had helped 35 youngsters pull their tight-fitting overshoes on or off, as the hour demanded. As she gave the final tug to Freddy's galoshes, he remarked thoughtfully, 'These aren't mine.' His harassed teacher counted to ten, then extracted Freddy's feet. He watched the process in silence. When it was all over, he volunteered, 'They're my sister's, but Mommy says I have to wear them today!" This illustrates a basic and realistic academic problem of finding the correct galoshes for our young and rapidly growing plastics industry.

It is my purpose to clarify such a proper fit for the assistance of our educators. What clouds the problem of supplying suitable education to prospective plastics engineers is the lack of a definition of such an engineer. Returns on this survey show that many people in industry do not have a clear picture in their own minds of the scope of this new profession. Obviously a plastics engineer should be differentiated from a chemical engineer, mechanical engineer, or other professional men. Yet the poorly defined lines of demarcation between these branches of engineering as applied to the plastics industry are demonstrated by the following quoted comments from this survey. One person in the plastics industry says, "In the manufacture of raw materials, the chemistry requirements are the more important." This comment could be more directly stated by saying that chemical engineers are more useful in the raw materials industry than plastics engineers. To manufacture high polymers or resins, a chemical engineer or chemist is best qualified, as the talents of a plastics engineer can be more efficiently utilized in another phase of this industry. To quote another comment, "I believe that the training outlined would be more useful to people in production, sales, and development than they would be in jobs devoted primarily to fundamental research programs." Here it might be paraphrased that plastics engineers are better suited for production, sales, and development work than research to clarify the scope of plastics engineering. It is implied that physicists and chemists are better suited for fundamental research. There are other cases in this survey where it appears that many people consider a plastics engineer to be a special type of materials engineer, which is not correct. A more clear picture of a plastics engineer is obtained by horizontal analysis of the returns to this questionnaire. Since plastics engineering is a new specialty, its scope and definition can best be expressed in terms of the other branches of engineering and sciences. The following percentages show the emphasis on other types of training required to make a plastics engineer.

Mechanical engineering	25.0%
Electrical engineering	18.9%
Chemical engineering	26.4%
Aeronautical engineering	4.6%
Chemistry	21.8%
Other sciences	3.3%

From these statistics, one can get a well defined picture of a plastics engineer. It is worth noting that there is a great emphasis on mechanical engineering which is in contradiction to many people's ideas on plastics engineering. From the above data, comments, and other information, I feel I am in a position where I am able to describe and define a plastics engineer. He is a person having technical skill and training in the conversion or processing of organic high polymers or resinous substances into useful products. In addition to this he is also concerned with the compounding, formulation, or modification of such materials for eventual conversion into some form of product with improved properties. This definition has been purposely kept general. However, it can be readily seen that the scope of this definition can include older and more firmly established fields such as rubber and paint technology. In my opinion, it makes no difference if the high polymeric substance is a rubber (elastomer) or if it is dissolved in a solvent. Basically these two specialties fall in the same general category which we have labelled plastics engineering. Now that I, with the aid of many people in the plastics industry, have painted a picture of a plastics engineer; we can challenge the educators to make their curriculum fit accordingly. Our teachers can use this information to advantage when selecting the proper balance of courses to train a plastics engineer for maximum usefulness to industry.

Many of the questionnaires returned in this survey contained interesting comments from individuals in the plastics industry and give a keen insight to their thinking. Some remarks were on a lighter tangent of the sub-

(please turn to page 68)

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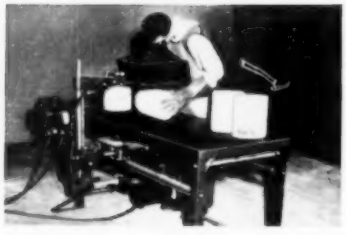

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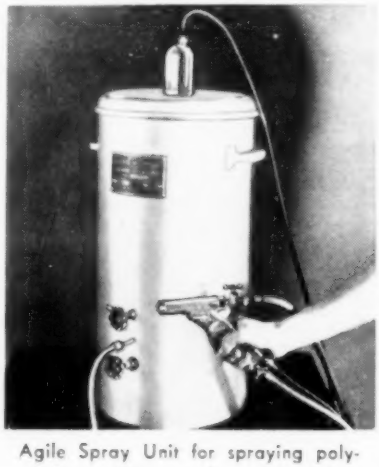

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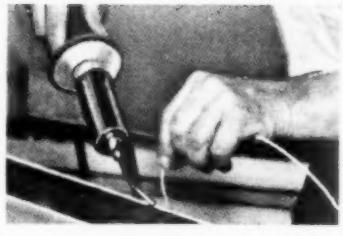

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Crane Co.
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(Crane Co.)

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519 Maple Row, Elkhart, Ind.

ROBBINS, MAX B.
Hoosier Cardinal Corp.
601 W. Eichel St., Evansville, Ind.

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30 N. LaSalle St., Chicago 2, Ill.
(A. E. Rubber Stamp Service, Inc.)

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Rogan Brothers
8025-8038 N. Monticello Ave., Skokie, Ill.

ROGAN, JULIAN J.
Rogan Brothers
8025-8038 N. Monticello Ave., Skokie, Ill.

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(E. I. duPont deNemours Co.)

ROUZER, KENNETH A.
18452 Roy St., Lansing, Ill.
(General American Transportation Corp.)

ROWE, LEIF A.
William Thoresen Co.
2035 Wabansia Ave., Chicago 47, Ill.

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Celanese Corp. of America
1514 Merchandise Mart, Chicago 54, Ill.

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79 E. Adams St., Chicago 3, Ill.

RUNDGREN, NELS E.
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5292 Northwest Highway, Chicago 30, Ill.

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6142 N. Avers, Chicago, Ill.
(Victory Manufacturing Co.)

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1026 W. King St., South Bend, Ind.

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2250 N. Pulaski Rd., Chicago 39, Ill.

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10336 S. Western Ave., Chicago, Ill.

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(Federal Telecommunication Labs., Inc.)

EBER, LEONARD K.
General Electric Co.
570 Lexington Ave., New York, N. Y.

EGG, LEON R.
Garfield Manufacturing Co.
P.O. Box 59, Garfield, N. J.

ELLIS, ROBERT C.
Dillon-Beck Manufacturing Co.
1227 Central Ave., Hillside, N. J.

ENGLER, HAROLD F.
B. F. Goodrich Chemical Co.
475-5th Ave., Rm 1600, New York 17, N. Y.

ERNST, ARTHUR H.
83 Church St., Woodbridge, N. J.
(Lapin Products, Inc.)

FAMELY, MAX
Garwood Plastics, Inc.
141 South Ave., Garwood, N. J.

FAYCIK, FRANK H.
RFD #5, Box 425, New Brunswick, N. J.
(National Tool & Manufacturing Co.)

FEELEY, M. JOSEPH
104 Linden St., Wyckoff, N. J.
(Boonton Molding Co.)

FEILER, LORE E.
Lor-El Co.
252 Paterson Plank Rd., Jersey City, N. J.

FELLOWS, FRED H.
Spaulding Fibre Co.
90-34 Jamaica Ave.,
Woodhaven, L. I., N.Y.

FERRARO, SAMUEL
1 May St., Belleville, N. J.
(Automatic Manufacturing Co.)

FIELDSTAD, HAROLD E.
Helmuth Tool & Die Co.
5 Sherman St., Linden, N. J.

FINK WARREN R.
295 Linden Ave., Belleville, N. J.
(Thomas Manufacturing Co.)

FLYNN, JAMES W.
Celanese Corp. of America
290 Ferry St., Newark, N. J.

FONTENELLI, JOHN J.
Fibre Corp.
501 South Ave., Garwood, N. J.

FONTENELLO, FRANK J.
Fibre Corp.
501 South Ave., Garwood, N. J.

GORIS, JULIUS Z.
38 Villawe Dr., Livingston, N. J.
(Pinkend Co.)

FORTNEY, EUGENE LOYD
Fortney Manufacturing Co.
217 N. J. RR Ave., Newark, N. J.

FOX, ROBERT J.
Detroit Mold Engineering Co.
1217 Central Ave., Hillside, N. J.

FRACKENPOHL, ROLAND
100 Hillside Terrace, Irvington 11, N. J.
(Interstate Mold Hobbing Co.)

FROSCH, C. J.
Bell Telephone Labs., Inc.
Murray Hill, N. J.

FRUTCHEY, HAROLD E.
304 Moore St., Hackettstown, N. J.
(Bergen Toy & Novelty Co.)

FUCHS, JOHN, JR.
262 Salem Rd., Union, N. J.
(L. Doerfler Manufacturing Co., Inc.)

GARRISON, DAVID H., JR.
1 Mall Dr., N. Plainfield, N. J.
(The Garrison Co.)

GERING, HERMAN
Gering Products, Inc.
7th St. & Monroe Ave., Kenilworth, N. J.

GERING, LARRY
Gering Products, Inc.
7th St. & Monroe Ave., Kenilworth, N. J.

GERLACH, ROBERT M.
3 Marshall St., SF, Irvington, N. J.
(Newark Die Co.)

GERSHEN, IRVIN J.
1060 Marine Corps School, Quantico, Va.

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74 S. Mountain Ave., Montclair, N. J.
(Milo R. Gerow & Assoc.)

GESELL, JOHN H.
Federal Telecommunication Labs., Inc.
500 Washington Ave., Nutley, N. J.

GIAIMO, MARIO
2184 Alpine Ave., Union, N. J.
(Lionel Corp.)

GIANNOTTA, CARMEN R.
9 Brookside Terrace, N. Caldwell, N. J.
(The M. W. Kellogg Co.)

GIESE, WILLIAM
Berkeley Engineer & Mfg. Co.
Berkeley Heights, N. J.

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Sylvan Plastics, Inc.
350 Fifth Ave., New York 1, N. Y.

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(Ordnance Dept., Picatinny Arsenal)

GLIDER, SYDNEY S.
1617 St. Marks Ave., Brooklyn 33, N. Y.
(Mastro Plastics Corp.)

GODFREY, GEORGE J.
21 Wellington Rd., Livingston, N. J.
(Koppers Co., Inc.)

GOLDRICK, RICHARD M.
Irvington Varnish & Insulator Co.
6 Argyle Terrace, Irvington 11, N. J.

GORMLEY, WILLIAM L.
American Hard Rubber Co.
Park Pl., Butler, N. J.

GOULD, WILLIAM
93 Sagamore Rd., Millburn, N. J.
(Keystone Plastics Co., Inc.)

GRING, DAVID H.
16 Brookside Ave., Caldwell, N. J.
(Celanese Corp. of America)

GROFF, FRAZIER
Bakelite Co., Div. of U.C. & C. Corp.
Bound Brook, N. J.

GROSS, HENRY
127 Radcliffe Ave., Irelin, N. J.
(Middlesex Tool & Machine Works)

GROVER, WALTER R.
Norman Chemical Products, Inc.
500 Madison Ave., New York 16, N. Y.

GROWLEY, JAMES T.
Kinney Corp. of America
500 Madison Ave., New York 16, N. Y.

GUICE, W. W.
22 Hutton St., Jersey City 7, N. J.
(Louis Marx Co.)

HAGGERTY, JAMES
J. Muehlstein & Co.
60 E. 42nd St., New York, N. Y.

HALL, G. LESTER
R. A. Koegl Stamp & Die Works
9 Evans Terminal, Hillside 5, N. J.

HALLIDAY, KENNETH C., JR.
Bendix-Pioneer Div.
Bendix Aviation Corp.
Teterboro, N. J.

HAMMOND, ROGER H.
Mack Molding Co.
Paterson Ave., Wayne, N. J.

HANKIN, ANDREW A.
E. I. duPont deNemours & Co., Inc.
740 Schuyler Ave., Arlington, N. J.

HANSON, ERNEST R.
77 Church St. E., Bloomfield, N. J.

HARRINGTON, ROBERT
Onondaga Manufacturing Co., Inc.
Onondaga, N. Y.

HARTONG, HAROLD
Kuppers Co., Inc.
Snyder Ave., Berkeley Heights, N. J.

HAYES, RALPH F.
Gering Products, Inc.
7th St. & Monroe Ave., Kenilworth, N. J.

HELANDER, FRANK G.
11 Primrose Pl., Summit, N. J.
(Watson Stillman Co.)

HERRING, JOHN A.
220 Linwood Ave., Caytesville, N. J.
(Naugatuck Chemical Div.,
U. S. Rubber Co.)

HOEHN, ROBERT H.
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Paterson Ave., Wayne, N. J.

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147 Gates Ave., Montclair, N. J.
(Irvington Varnish & Insulator Co.)

HOLBROOK, GEORGE C.
668 Rock Rd., Glen Rock, N. J.
(Weston Instruments Co.)

HOLRAN, PAUL D.
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7th St. & Monroe Ave., Kenilworth, N. J.

HOLZL, ALBERT B.
Eagle Tool & Machine Co.
9 Evans Terminal Rd., Hillside 5, N. J.

HONISH, JOHN K.
25 Undercliff Rd., Millburn, N. J.
(Bakelite Co., Div. of U.C. & C. Corp.)

HOY, HAROLD L.
Helmuth Tool & Die Co.
1 Sherman St., Linden, N. J.

HRONEK, JOHN F.
Fellows Gear Shaper Co.
2206 Empire State Bldg., New York 1, N.Y.

HUDEKOPER, PRESCOTT F.
Shaw Insulator Co.
110 Colt St., Irvington, N. J.

HUMPHREY, RICHARD A.
688 Upper Mountain Ave.,
Upper Montclair, N. J.
(Myralex Corp. of America)

HUTCHEON, CHARLES F.
World Plastix
1685 Boone Ave., Bronx 60, N. Y.

HUTCHINGS, JOSEPH L.
Brooklyn Machine Co., Inc.
50 Church St., New York 7, N. Y.

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Spaulding Fibre Co., Inc.
905 Broad St., Newark 2, N. J.

HYMAN, JOSEPH B.
Catalin Corp. of America
Fords, N. J.

INGHAM, PHILIP H.
Interchemical Corp.
Bound Brook, N. J.

JONES, DAVID ALLEN
Celanese Corp. of America
290 Ferry St., Newark, N. J.

JORDAN, CLIFFORD
Plastex Process Co.
250 W. Passaic St., Maywood, N. J.

JORDAN, RUSSELL C.
Plastex Process Co.
250 W. Passaic St., Maywood, N. J.

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(M. W. Kellogg Co.)

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23 Union St., Stirling, N. J.

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2275 Vaux Hall Rd., Union, N. J.
(Elizabeth Tool & Die, Inc.)

KAST, HAROLD L.
Plastic Inlays, Inc.
282 Broad St., Summit, N. J.

KATELUS, GEORGE J.
12 Wade Ave., Cranford, N. J.
(Irvington Varnish & Insulator Co.)

KAUFMAN, ALBERT A.
Industrial Synthetics Corp.
225 North Ave., Garwood, N. J.

KAUFMAN, KENNETH A.
1308 W. 78th St., Prairie Village 15, Kan.
(Gering Products, Inc.)

KELLER, ARTHUR M.
76 E. Cedar St., Livingston, N. J.
(Conmar Products Corp.)

KEMPS, ANTON THEODORE
New Jersey Tool & Die Co.
800 Colfax Ave., Kenilworth, N. J.

KENEN, IRVIN O.
Nixon Nitration Works
Nixon, N. J.

KENNELLY, WILLIAM J., JR.
123 Westview Rd., Upper Montclair, N. J.
(Latrobe Steel Co.)

KEREKES, THEODORE J.
41 Broad St., Newark 1, N. J.
(Columbia Engineering Co.)

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33 Oakland Ave., Morristown, N. J.

KLEISER, PAUL
113 Codwise Ave., New Brunswick, N. J.
(Sun Tube Corp.)

KLEIN, PHILIP
Gilbert Plastics, Inc.
1415 Chestnut Ave., Hillside, N. J.

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New Freedom, Pa.

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KOOP, NEIL A.
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(Bright Star Battery Co.)

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(Garray Plastics Co.)

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(Park Plastics Co.)

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502 South Ave., Garwood, N. J.

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690 Chestnut St., Union, N. J.

LEYES, CHARLES E.
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(Precision Industrial Design)

LOMBARDI, JOHN P.
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(Embart Manufacturing Co.)

LORDLY, L. CHESTER
RFD #1, Chatham, N. J.
(Anywood Plastics Co.)

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Boonton, N. J.

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(Celluplastic Corp.)

MAC ALMON, EDWARD L.
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181 Upper Mountain Ave., Montclair, N. J.
(Mack Molding Co.)

MANGANELLI, MICHAEL A.
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(Monsanto Chemical Co.)

MANN, BASIL E.
19 Parkview Ave., Belleville 9, N. J.
(O'Hara-Rowan & Associates)

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902 W. 12th St., New York 18, N. Y.

MAXWELL, BRYCE
Princeton University
30 Charlton St., Princeton, N. J.

MAYER, MARK G.
165 Isabella Ave., Newark, N. J.
(Thomas Manufacturing Corp.)

Mc CARTHY, VINCENT D.
Gering Products
7th & Monroe Ave., Kenilworth, N. J.

MEARS, VINCENT L.
Vulcanized Rubber & Plastics Co.
138 Pennsylvania Ave., Morrisville, Pa.

MEYER, JOSEPH E.
1030 Evergreen Ave., Plainfield, N. J.
(Prolon Plastics)

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American Cyanamid Co.
30 Rockefeller Plaza, New York 20, N. Y.

MICHAUD, CLARENCE L.
Celanese Corp. of America
290 Ferry St., Newark 5, N. J.

MIKSCH, NATHAN
Newark Die Co.
21 Scott St., Newark, N. J.

MISTRETTA, RAYMOND S.
Gering Products, Inc.
7th & Monroe Ave., Kenilworth, N. J.

MORGAN, COLEMAN P.
Vulcanized Rubber & Plastics Co.
138 Pennsylvania Ave., Morrisville, Pa.

MOSS, HIBBERT W.
62 Beckman Rd., Summit, N. J.
(Improved Machinery Co.)

MUNYAK, JOHN A.
33 North St., Syosset, L. I., N. Y.
(Gering Products, Inc.)

NATURALE, ANTHONY
6 King St., Wenford, Dela.
(Maryland Plastics)

NATURALE, JOSEPH W.
100 Ellington St., E. Orange, N. J.
(Naturale Tools, Inc.)

NAUERZ, CARL O.
Helmuth Tool & Die Co.
7 Sherman St., Linden, N. J.

NEWCOMB, BENJAMIN R.
101 Piedmont Dr., Round Brook, N. J.
(John Waldron Corp.)

NEWMAN, HARRY
Riverdale Plastics Develop. Corp.
423 Third St., Jersey City 2, N. J.

NICHOLL, J. F.
252 Christopher St., Upper Montclair, N. J.
(Lamite Div., Chicopee Mfg. Corp. of Ga.)

NICHOLS, ANTHONY
Celluplastics Corp.
30 Ave. L, Newark 5, N. J.

NICLAUS, WILLIAM L.
Wilbert Engineering & Mfg. Co.
244 Dukes St., Kearny, N. J.

NUFER, ARTHUR
11 Durham Dr., Clark, Rahway P.O., N. J.
(Bakelite Co., Div. of U.C. & C. Corp.)

O'BRIEN, JOHN C.
Shaw Insulator Co.
160 Coit St., Irvington 11, N. J.

O'CONNELL, JOHN JOSEPH, III
Shell Development Co.
30 Commerce Ct., Newark, N. J.

OGANDO, JOSEPH A., JR.
177 Wheaton Pl., Rutherford, N. J.
(Plastic Mold Tool & Die Co.)

O'HAGAN, WILLIAM D.
111 Willow Brook Rd., Staten Island, N. J.
(Newark Die Co.)

OLSEN, M. A.
1 Paulus Blvd., New Brunswick, N. J.
(Modern Plastics)

PALME, ANTON J.
111 Prospect St., S. Orange, N. J.
(Fidelity Tool Co.)

PALMER, SPENCER E.
Eastman Chemical Products, Inc.
Kingsport, Tenn.

PARRY, HARVEY L.
2615 Leslie St., Union, N. J.
(Shell Chemical Corp.)

PARSEKIAN, RICHARD A.
134 Dunellen Ave., Dunellen, N. J.
(Pareloid Chemical Co.)

PASECZNYK, JOSEPH M.
Ridgedale Ave., Whippany, N. J.
(Spaulding Fibre Co.)

PATON, JOHN B.
91 Beech St., Arlington, N. J.
(E. I. duPont deNemours & Co., Inc.)

PEACOCK, WILLIAM HENRY
83 Grove St., Elizabeth, N. J.
(Calco Chemical Div., Amer. Cyanamid Co.)

PERLY, HARRY E., JR.
153 E. Blackwell St., Dover, N. J.
(Ordnance Dept., Picatinny Arsenal)

PERO, ALDO S.
Precision Extruders, Inc.
289 N. Main St., Leominster, Mass.

PETERS, MARK W.
Nixon Nitration Works
Nixon, N. J.

PFAFF, PETER
Wilbert Engineering & Mfg. Co.
244 Dukes St., Kearny, N. J.

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229 A Pershing Rd., Clifton, N. J.
(Latrobe Steel Co.)

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11 Oakley Ave., Summit, N. J.
(Rohm & Haas)

PORTER, CHARLES A.
Box 87, Mauricetown, N. J.
(Kimble Glass Co.)

POSCHNER, KARL G.
Helmuth Tool & Die Co.
7 Sherman St., Linden, N. J.

PRASSL, ANTON
1915 Oakwood Pkwy, Union, N. J.
(L. Doerfler Manufacturing Co., Inc.)

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145 Bryant Ave., Springfield, N. J.
(Cellumastics, Inc.)

PRESTON, WILLARD M.
39 Baltusrol Way, Short Hills, N. J.
(Koppers Co., Inc.)

PREUSS, PETER P.
1852 Lamberts Mill Rd., Westfield, N. J.
(Gilbert Plastics Co.)

PROBST, KARL J.
Reilly Tar & Chemical Corp.
191 Doremus Ave., Newark 5, N. J.

PUDERBAUGH, GEORGE
16 New St., Mountain View, N. J.
(Curtiss Wright Corp.)

PYHEL, HENRY J.
2017 Hudson Terrace, Fort Lee, N. J.
(Hendick Co.)

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219 Glenbrook Rd., Stamford, Conn.
(Schick, Inc.)

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REED, GEORGE H.
American Hard Rubber Co.
93 Worth St., New York 13, N. Y.

REESE, EDWIN P.
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(Consolidated Molded Products)

REEVES, HERBERT WEST
American Hard Rubber Co.
Park Pl., Butler, N. J.

REXER, ALFRED T.
645 Hort St., Westfield, N. J.
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9 Evans Terminal, Hillside 5, N. J.

RINALDI, JAMES D.
Newark Die Hobbing & Casting Co.
24 Scott St., Newark 2, N. J.

ROGERS, JOSEPH C.
21 Raleigh Rd., Washington Park
Nixon, N. J.
(Industrial Hard Chromium Co.)

ROMANOWSKI, HENRY JEROME
680 Summer Ave., Newark, N. J.
(Trels-Art Plastics Co.)

ROSENHEIM, DAVID J.
Laurel Plastics, Inc.
Ocean Ave., Lakewood, N. J.

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O'Hara-Rowan Associates
Bassett Bldg., Summit, N. J.

RYAN, EDWARD N.
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(Bloomfield Molding Co.)

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1237 Hidden Circle, Mountainside, N. J.
(Pyro Plastic Corp.)

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211 N. 15th St., Bloomfield, N. J.
(Resistoflex Corp.)

SCHEIDT, THEODORE WILLIAM
112 Sanhican Dr., Trenton 8, N. J.
(Consolidated Cork Corp.)

SCHENKAMAN, JACK
2799 Carol Rd., Union, N. J.
(Industrial Plastic Co.)

SCHIEFER, CARL EUGENE
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Plant #2, Poughkeepsie, N. Y.

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290 Ferry St., Newark 6, N. J.

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129 Burd St., Pennington, N. J.
(Panelyte Div., St. Regis Paper Co.)

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Schnur-Appel
2165 Morris Ave., Union, N. J.

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Columbia Rd., Morristown, N. J.

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Newark Die Co.
Scott St., Newark, N. J.

SCHWARZ, HELMUTH K.
Smith Tool & Die Co.
Sherman St., Linden, N. J.

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Coit St., Irvington, N. J.

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(Reed-Prentice Corp.)

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SIMMONS, PETER W.
Blackwood Lane, Hillsdale, N. J.
(The Dow Chemical Co.)

SIMON, JACOB
Best Plastics, Inc.
Chestnut Ave., Hillside, N. J.

SKEELS, ARTHUR N.
Roll Leaf Stamping Co.
Hudson Blvd., N. Bergen, N. J.

SKEIST, IRVING
Edgar St., Summit, N. J.
(Skeist Products)

SMITH, HERBERT A. T.
Albany St., Cazenovia, N. Y.
(Thermoid Co.)

SMITH, WALTER F., JR.
Boonton Molding Co.
Myrtle Ave., Boonton, N. J.

SOLTUS, EDWARD B.
Stewart Mold Engineering Co.
Central Ave., Hillside, N. J.

SPAAK, ALBERT
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(Mettle Machine & Tool Co.)

SPITZIG, EDMUND W.
Newark Die Co.
Scott St., Newark, N. J.

STAAB, GEORGE J.
Allison Dr., Short Hills, N. J.
(Sterling Plastics Co.)

STANLEY, FRED B.
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(Modern Plastics)

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STERN, JEROME J.
W. Hudson Ave., Englewood, N. J.
(Whyte Manufacturing Co.)

STEWART, JAMES M.
11-B Forest Dr., Springfield, N. J.
(Federal Electric Products Co.)

STINE, HERBERT GARFIELD
RFD, Millington, N. J.
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(continued from page 21)

ject of education. Lack of adequate instruction in this field is reflected by one person's comment, "The course on design deserves more emphasis than is indicated on end-use applications, where and where not to use plastics, etc." Similarly it was said, ". . . . course 7 on plastics design should also cover basic consideration of mold design and limitations of plastics." No doubt many mistakes in the use of plastic materials have provoked these thoughts. The challenge to our educators becomes even more complex when one suggestion states, "I presume there is some course in the basic engineering which will teach young graduates how to impart all this knowledge to experienced, older plastics personnel without getting in wrong." This supervisor's problem with his subordinate is obviously not within the sphere of this discussion. Nor is another problem in industrial relations the concern of the teachers as demonstrated by this quote, "Some program is necessary to convince the public that every person in the world is not a plastics expert."

Such comments of course reflect individual's ideas but may not have general significance or value to the subject of education of plastics engineers. In some cases the questionnaires contained some well thought out ideas of value to all of us. A wealth of background experience with technical personnel in the plastics industry has prompted a few people to benefit this study with their thoughts which well deserve presentation to you. Our educators should study these ideas carefully, as they will serve us a guide to align academic efforts with industrial needs. In criticism of the SPE education program, it was said, "The program outlined seems to me to be weak in the coverage of equipment and processing, especially since this is an advanced engineering project. Might be well to split into two courses, covering chemical processing and mechanical processing. The latter should be two to three times as long as the former." I wish to emphasize the significance attached to the mechanical part of a plastics engineer's background. Again this same accent on education is illustrated by another opinion, "On the basis of our experience we find that men available for positions in the plastics industry have more than adequate theoretical training but utterly lack concepts of practical application. Rather than making the plastics laboratory course available to under-graduates it is our opinion that such a course would be of greater value to seniors or even post-graduates. The curriculum of the theoretical courses should be arranged more with a view to production both as to manufacturing methods and end products." To hear the following quote from another member of the plastics industry should give our educators some pleasure and satisfaction, "Such training would give a broad understanding of the plastics field even though an individual will soon have to specialize in some specific phase of the industry. This basic understanding should be helpful to the individual regardless of his specialization and in the long run to the plastics industry as well." Such criticisms are pertinent and helpful to our joint industrial and university problem of education. To those people who have given special thought and time to comment on the SPE "Program for Professional Engineering Education in Plastics," the Educational Committee owes particular gratitude.

To conclude this dissertation on industrial interests in education of plastics engineers, I think that it should be pointed out that we have around us many skeptics. For example, I quote Winston Churchill who says, "I have no technical and no university education, and have just had to pick up a few things as I went along." Why do we worry about education anyway? Of course Mr. Churchill, even as a great leader, has never to my knowledge made any technical contribution to the field of the natural sciences. Although he may be a great orator, I doubt if even he can argue against the fact that the greatest deterrent to the growth of the plastics industry today is the lack of properly trained engineers.

REFERENCES:

(1) Journal of The Society of Plastics Engineers, October 1953.

(2) Program for Professional Engineering Education in Plastics, presented and published by The Society of Plastics Engineers 1949.

(3) NEA Journal, "Classroom Classics" by T. M. Stinnett.

3 Future Growth of the Plastics Industry

H. A. Gadd

Canadian General Electric Company, Ltd.

The plastics industry is comprised of two main groups, one being the raw materials suppliers and the other the molders, fabricators and processors.

My own direct experience is in the area of custom molding and extruding or in other words, the business of producing plastics goods from the compounded materials. The opinions I might express then have been developed in that field, with, of course, the benefit of a working association with the material supply people. Within the limitations of that background I shall attempt to deal as broadly as possible with the title topic.

GROWTH IN SIZE

First, may we consider the future growth of plastics in size. Synthetic plastics is a relatively new industry and it has grown rapidly, and the growth has accelerated progressively.

A concept of the advance in business volume may be gained from a curve plotting the output of synthetic resins. Such a curve was published by the Society of the Plastics Industry in their booklet "Plastics, The Story of an Industry." The major portion of synthetic resin production is consumed by the plastics industry and therefore this chart provides a record of plastics growth. Production grew from less than 6 million pounds in 1922 to approximately 2 billion, 6 million pounds in 1952. The figures show that the U. S. industry practically doubled in size every five years over the 30 year period. Canadian industry figures can be taken as roughly relative in proportion to population. For today's purpose, I chiefly wanted to point out to you the physical shape of this curve and the trend of its direction upward.

I refer further to a paper entitled "Past and Future Growth of the Chemical Industry" by Raymond H. Ewell, Stanford Research Institute, Stanford, Calif., which was published December 10, 1951, in Chemical and Engineering News. This article is not new and many of you will have seen it, but it seems of extra value to me in that I believe Mr. Ewell's predictions have to date been generally borne out.

Mr. Ewell's figures show that during the period 1925 to 1950 the average growth rate of the chemical industry was 10% per year and the average growth of synthetic plastics 15% per year. This compares to an average growth rate for all U. S. industry of 3% per year. These comparisons are in terms of physical volume, not dollar sales.

From a study of the previous 25 years performance to 1950, Mr. Ewell has projected the sales of the chemical industry overall and of the major end chemical groups in these values from 1950 to 1975.

Regarding the basis of these predictions the following is quoted from Mr. Ewell's article: "The projection of plastics, fibres, medicinal chemicals, fertilizers, surface active agents, pigments, solvents, dyes, and insecticides presented in this article were made by graphical means taking into account the past growth rate, replacement savings, saturation of markets, technological trends (in some cases), and other factors."

Again I quote: "For example, if the growth trends of plastics during the past 25 years were continued until 1975, the sales would be twenty-six billions. Our projection has cut this figure down to eight billions. This reduction represents the degree of conservatism in this article, since it is not beyond the realm of possibility that the growth rates of the past 25 years will continue for another 25 years." For clarity, this last quotation has been condensed to mention only plastics, but similar examples of other chemical products are included in the report.

Again it is interesting to note the shape of this curve. The plastics curve climbs more rapidly than that of the total chemical industry. The actual plastics performance figures during the depression years are also of significance when you note the continued steep increase from 1931 to 1937. From 50 millions in 1930 the business multiplied its output 3.6 times in the ten years to 1940 (180 millions).

It is my view that Mr. Ewell's thoughtful analysis discloses a reliable picture of the future size of the plastics business.

There are numerous other records and statistics to which we could turn for a view of the probable future. Trade papers and the financial press tell constantly of new products and new investments in plant and equipment.

The Financial Post, our Canadian contemporary of the Wall Street Journal, carried an article in the financial section just a few weeks ago, entitled "Plastics Future Unlimited, Record '54 Sales In Sight." The article says: "New applications, new materials, more aggressive merchandising promise to boost the Canadian plastics industry's sales to record highs in 1954.

"Despite a fivefold rise in primary plastics production over the last 10 years, with a 15% jump in 1953 over '52, officials are saying the market potential has just been scratched. Every month, every week brings new applications in industrial and consumer products, broadening the growth base of this fast-stepping young industry and adding to its competitive strength." This article concludes by saying: "You just can't compare the growth possibilities of plastics with other long-established materials."

I am not a statistician but I have great faith in these promising predictions just reviewed. There are many factors within our own knowledge and experience to support them. The avenues for growth consist firstly of expanding the application of the existing plastics materials. Even the phenolics which have been with us since 1909 are still driving into new fields, particularly in relation to size of moldings as evidenced by television cabinets and other large pieces not produced on a commercial scale before.

We now have more than 25 different basic plastics, most of them available in many different formulations. Some of the newer ones are in their infancy so far as application is concerned.

Recognition by some user industries has been rapid. In a ten year old refrigerator you find practically no plastic parts. Today the interior fittings are predominantly plastic. Some other industries, though, are almost virgin fields as refrigerators were ten years ago.

Progressive manufacturers are always looking for improved product design to accomplish better appearance, function and cost. Here, cooperation and assistance by the plastics people with the end user pays off in expanded markets for plastics. In industrial cost reduction and value analysis activities in particular, plastics are most frequently the answer to better values when applied ingeniously and skillfully.

A Canadian washing machine manufacturer saved $1 on each machine by standardizing on a phenolic plastic agitator instead of a metal one. Product value was enhanced because the plastic agitator is found to be easier on the clothes and eye appeal of the appliance is improved. The annual saving was $20,000.

The same manufacturer adopted impact styrene masking plates on the wringer at a cost of 53c a pair as compared to $1.20 for finished die cast plates. He has improved appearance and if the surface is scratched in service the color is retained, which it would not be on a painted metal plate. Also he's saving $13,400 dollars annually.

A Canadian city utility is paying 48% more for an acrylic street light diffuser than they were for glass and they are saving $15,000 dollars annually in reduced breakage, replacement, cleaning and transportation costs.

An American manufacturer re-engineered a very small contact and terminal assembly containing 15 parts into a 4 part assembly by molding the working parts permanently into a nylon block, eliminating all of the screws, clamping plates and insulating tubes. A more functional part was made at a cost saving of $14,000 a year.

Vegetable producers used to leave the tops on carrots to keep the roots fresh. Shipped now without tops in polythene bags, the shelf life is increased by ten days and the average saving in freight cost is about 55c per crate.

These few examples are typical of the whole industry. They show progressive replacement of the older materials by plastics to the benefit of the overall economy and of the standard of living. The challenge is to the interested individuals in the plastics industry to pursue the exploration and for the industry to equip itself with enough trained and competent personnel to cope with the opportunities.

Another distinct growth influence is the probable introduction of new plastics types and improvement of the established ones. Only eight years ago polyethylene became available commercially; in 1953 one hundred and forty-two million pounds of it was used in the States and Canada. It is expected that this will be doubled again in a year I'm told.

When these things can happen so fast and we remember that in a recent ten year period twelve new basic plastics were introduced, then we can confidently expect some more new ones in the years ahead.

Still another effective factor in market size is the continued improvement in economic relations between plastics and the materials they replace. Phenolic, styrene

FORUM

and polyethylene are some compounds that have been reduced in price within the last year and molders' costs improve with greater volume, improved methods and equipment. Thus some specific items not quite competitive in plastics a year ago, might very well be so now.

Unquestionably there are opportunities for very great future growth of the plastics industry. I submit though, that we must accept this as a potential—not as predestined fact. The fulfillment will depend a lot on the effectiveness of the industry.

GROWTH IN TECHNICAL QUALITY

That a high order of technical quality is required and does exist is indicated by the list of technical subjects being dealt with at this S.P.E. Conference. Moreover, most companies are equipped to engineer and they do produce goods of unquestionable quality.

What I have to say now is no reflection on those valuable engineers and scientists who have contributed to the building of the plastics industry and those who now carry it on. I feel convinced, though, that we have a double-barrelled matter of concern:

1. The requirement to become **more** scientific throughout the operations.
2. The limited number of technically trained and experienced plastics engineers available and the time it takes to develop them.

Perhaps I should try to define here what I mean by more science as applied to plastics operations. I think particularly toward the ability to predict conditions in advance on paper by the use of formulae to reduce empiricism to the very minimum. The artisan approach on the other hand, employs intuition, the memory of past practical experiences, and native talent mixed with skill. This practice does exist and it sometimes produces a situation where a design or operation is processed with more hope than confidence and then followed by tedious fits and tries to bring about the desired result.

Scientifically, I believe the compounders and materials people are in the better position, and understandably so because the development and manufacture of plastics compounds is largely chemistry and chemical engineering, which sciences are provided for educationally. In the application and servicing of his product, however, the materials vendor faces exactly the same problems as the molder.

Some others share the opinion with me that the plastics molding business is practiced predominantly as an art and not much as a science. I venture to estimate the division as over seventy-five percent art and less than twenty-five percent science. The advance to this point has been hard won and is not to be depreciated but it is still far short of the appropriate balance.

When we build a mold or extruding die and then have to change it once or more before it will work; when we design a mold heavier than need be or so light that it breaks; when a part has left our plant O.K. but arrives at the customer's plant warped or with shrunken dimensions; when costs get all out of line because an unexpected problem arises; as a matter of fact, when practically any of the molders' numerous headaches occur, we are a victim of the art rather than beneficiaries of the science.

The engineer who designs a bridge or the architect a sky scraper does not get a second chance if his structure falls down after completion. Their designs, however, are based on known and proven data.

Some key personnel in the molding shops are those valuable men who can make a mold or die produce satisfactory parts when it doesn't want to. By experience, they usually know exactly what to do. In the more difficult situations they know twenty-seven or more different things to try. They almost invariably win out but the time loss is often great and they usually are not sure which one or combination of things caused the success.

An old-time brewmaster found by accident a rather complicated but effective method of overcoming a brewing problem. He used it for years. Finally he told his son, a brewmaster who was also a chemist, about it. It worked for the son, too, but he found out **why** it worked. With that as a basis he found a much simpler way to do the same thing.

The group I work with have discussed this question, "What does the plastics industry most need to reach the same or higher technological standards as the older technical industries?" The conclusion is that we need impetus in the following:

> Documentation of experience, penetrating analysis and application of the principles and laws that have been derived; in other words, search for the underlying facts, find them and apply them.
>
> Ability to apply fundamental physical laws with ingenuity.
>
> Unlimited creative thinking.

These are the fields generally fulfilled by academic engineering graduates but plastics is so diversified in its special requirements that the conventional engineering degree courses do not produce men ready for useful service in plastics. Apart from the normal period of adjustment in industry, a graduate mechanical, electrical or chemical engineer usually needs an internship of several years in plastics operations to orient himself to the point of important contribution.

Obviously the offering of degree courses directed to the science of plastics in more universities would improve the situation immensely. Mr. Bartlett's survey and Doctor Winding's paper have indicated some of these points.

Venturing opinion on the subject content of such a course, it seems to me that mechanical, electrical, electronics, chemical, physics, the properties of matter, mathematics and business training are, of course, general requirements. Chemical subjects would be outstandingly important in materials manufacture. To the molder the chemistry and behaviour of polymerization are significant and so is metallurgy because of the basic importance of molds and dies. The ability of the individual to get along with people is essential for integration in any organization. All of this can be well left with the educators, but I would particularly stress the importance of practical industrial experience. The course should include plastics work in operating plants during specified periods, then the graduate would be more ready for immediate practice.

Another industry of rapid growth is electronics and I think its success has been made possible largely because electrical engineers could specialize readily. In the television and electronics factories known to me, the engineers are not confined to pure engineering. You find graduates among management, supervision, plant service, functions and sales. Thus the whole organization is toned to a higher technical pitch. The same could apply to plastics with more trained people available. I feel sure that professional plastics engineers are needed by material

[illegible] application and technical service; by equipment [illegible] manufacturers for engineering and service; by molders and [illegible] fabricators for engineering, product development, cost [illegible], statistical quality control, and management; plus [illegible] demand for sales engineers in all phases.

[illegible] make possible the necessary special education [illegible] require industry cooperation with the schools, especially regarding training employment, also industry [illegible] be prepared to pay adequate compensation to the graduates. I believe that these things would be forthcoming and that they would be the best possible investment for the plastics manufacturers.

I conclude by suggesting that the engineering profession has particularly wide opportunities and obligations in the whole field of plastics and I have confidence that these obligations and opportunities will be discharged.

4 The college view of a plastics engineer

J. H. Lampe
North Carolina State College

The plastics industry has many categories in its field of need for plastics engineers. The need varies in a horizontal as well as a vertical way. The small industries in most cases hope for a man completely trained in specific details. Large industries most likely will be pleased to train men on the job. Of course, there are exceptions to both these situations. I make the statement as a result of talking with many people in your industry and reading carefully the surveys that have been made by members of your Educational Committee. I must conclude that I believe it is impossible to approach satisfactorily all these requirements in a one-package educational program.

Let me complicate this problem of undergraduate study a bit further by challenging a basic premise that you must have made, and that is your assumed position that young men at college in sufficient numbers would be interested and would enroll in a program devoted to Plastics Engineering. I feel that Mechanical Engineering, Chemistry, or Chemical Engineering (a combination of the previous two) might too often be the selection of the student rather than a program that requires a commitment on the student's part to a segment of Chemical Engineering, let us say. The important question, however, I believe is what is being done to interest students, as well as educators, in the field of Plastics Engineering. This is important not only from the student's viewpoint, but from the overall **manpower** viewpoint as well. My desk is constantly besieged with statistics concerning the shortage of trained engineers today. I would like to cite just a few of these, from informed sources, which will point up the crisis now facing the nation.

The current need for engineers is estimated at over [illegible]. Some sources claim it is close to 60,000. But only 21,000 engineering students graduated in 1953 and we expect only 17,000 in 1954, and 20,000 in 1955. Of these a large number are R.O.T.C. members and men whose deferments will terminate and who can expect to be called to active duty. This group will be somewhat balanced by returning service men. Thus, even after the June 1954 graduating class is employed, we can expect a national deficit of from 10,000 to 15,000 engineers. In addition to the accumulated deficit of over 20,000, there will be a continuing need for new engineers which can be estimated at 30,000 each year. The present trends in engineering college enrollment indicate that the supply might meet the demand in approximately 1960. To say we are experiencing a shortage of engineers is one of the understatements of the year.

Our only solution to the problem is necessarily a long-range one. It involves attracting more young men, and young women too, into the study of engineering. Prospective students must be well informed about the professional opportunities and rewards that accompany an engineering career. The vital part that engineers play in our modern civilization is self-evident. We see on every hand the products of engineering skills and accomplishments. Nowadays, the engineer is needed not only in the design or operation of manufactured products, but in sales, production, and even management. This means to me that competition is keen for the young men of ability who are training for industry. Plastics Engineering, if it is to get its needed percentage of college graduates, must undertake a long-term guidance and informational program for sophomores and juniors that is dynamic and appealing.

As Dean of Engineering at North Carolina State College, which is a part of the University of North Carolina, I head an activity where 2100 young men are studying engineering at the undergraduate and graduate level and where considerable research work is under way, some in plastics. These young men are studying many fields of engineering in their four-year bachelor programs, but all the curricula are basic and fundamental as to the technical field, economics, and the humanities. Specialization, if any, is through elective courses. We are experimenting with one or two specialized curricula, but these programs are not truly engineering, but rather training toward operation and management.

We believe that the undergraduate, especially in his first two or three years, is not in a position to make an intelligent decision as to a specialized program or specialized electives; and, too often talents are wasted and poor results obtained. We encourage elective courses (few in number) in the senior year. Likewise, if a young man is to undertake additional years of study leading to advanced degrees, he can only do so profitably in an environment of teaching and research by qualified teachers and engineers in his field of interest — in this case, Plastics Engineering. While the plastics industry is large and growing, it certainly most likely would not have opportunities for many men at this level. Therefore, such a program in Plastics Engineering, or any similar special field, could only be offered economically at a few institutions. Such a program at a few institutions might well be encouraged and supported through financial aid, scholarships and fellowships by the plastics industries.

In addition to the traditional college graduate programs leading to advanced degrees of Master and Doctor of Philosophy, I believe there is another opportunity to further your plastics educational program. This is the possibility of supporting and encouraging a fifth year of a specialized engineering study in Plastics Engineering. Such a program could lead to a Professional degree of Plastics Engineer. This type of program is now possible in other fields at N. C. State College; for example, Sanitary Engineer, a degree obtained as a result of one year of very specilized training in this field following the completion of a Bachelor's degree in Civil Engineering.

(please turn to page 90)

AROUND THE WORLD

AUSTRALIA

AUSTRALIAN PLASTICS

Vol. 8, No. 101, December 1953

Abstracter: Albert Lightbody

UNPLASTICIZED P.V.C. (P 15-19)
Extract from a Paper by George S. Laaff

Rigid polyvinyl chloride is being widely used in applications where corrosion resistance is required. Fabrication can be by welding and the design must be controlled to get optimum performance.

PLASTICS IN GREAT BRITAIN AND THE CONTINENT (P 29)

Recovery of these areas since the war has been remarkable with heavier exports expected. Two million pounds of polythene has been exported to the U.S. by Imperial Chemical Industries. P.V.C. is replacing rubber in the conveyor belting in the coal mines. New production is starting in phthalic anhydride. Prices are generally being reduced.

POLYVINYL CARBAZOL (P 35-36)

Luvican M-170 is now available for injection molding. Its high temperature resistance (200°C) and excellent electrical properties (low dielectric loss) make it of special interest.

BELGIUM

MATIERES PLASTIQUES ET RESINES SYNTHETIQUES

No. 68, Jan.-Feb., 1954

Abstracter: Alfred P. Daignault

AN EASY METHOD FOR IDENTIFYING PLASTICS

A very brief description of flame tests for identifying the more commonly used plastic materials.

EXPANSION IN POLYETHYLENE (Page 8)

A short article on the present demand and supply picture of Polyethylene in the U. S. and announcement of Bakelite's expansion plans.

A NEW TEXTILE FIBER (Page 8)

A description of "Rayocord X" recently introduced by Rayonier, Inc.

PLASTIC-STEEL LAMINATES (Page 9)

A short article concerning the successful lamination of steel or aluminum with plastic as recently announced by the laboratories of U.S. Rubber Co. Possible applications listed are panels for exterior and interior use in construction, garden furniture, office machine housings and piping.

A NEW FORMULA FOR WATER BASE PAINT (Page 9)

A short description of Reichold Chemicals "Hydrophen", a plasticized phenolic resin for use on metallic surfaces such as automobile bodies and farm machinery.

"ORNAMIN" A NEW GERMAN PRODUCT (Page 10)

Extracted from the Ubersee Post.

This article describes a new textile coating which reportedly can be applied to any material with effect of making it waterproof but still allowing air to pass through. The coating in no way affects the appearance of the material and improves wear resistance and soil resistance. Possible applications listed include rainwear, sports togs, tents, work clothing, umbrellas, and inflatable mattresses.

The material is also not affected by heat, cold, exposure to sunlight, hydrochloric and sulfuric acid.

THE AMERICAN PLASTICS INDUSTRY (Page 11)

This article gives a short history of the plastics industry in the United States. This is followed by a description of the various plastic materials listing types (thermosetting, thermoplastic, etc.), products within groups (vinyls, acetates, butyrates, etc.) and trade names. A short description of extrusion, injection, and compression follows.

(This article is to be continued)

SOME PLASTIC APPLICATIONS

Illustrated Usages

1. Games—checkers, dominoes
2. Industrial usage of plexiglas—Protective devices on machinery
3. Vinyl—raincoats, garment bags, packaging film.
4. Housewares — styrene cup and clock housing.
5. Bookbindings.

PLASTIC MATERIALS IN BUILDING & DECORATING OF THE HOME (Special Supplement)

Section 1. A very general description of plastic usage in insulation, electrical equipment, plumbing, flooring, wall covering, and home furnishing.

Section 2. Use of Laminates in wall covering

(Extract from "Plastiques-Information"—Paris)

A description of method & advantages of using "Panelyte" wall panels for wall covering.

Section 3. Illustrations of Plastics Usage in the Building Trades & Home Furnishing

a) Bar & radio cabinet—"Warerite" laminate
b) Lighting fixture — Monsanto "Lustrex" Polystyrene
c) Floor mat—PVC woven bands.
d) Hand railing—"Mipolan" PVC extrusion
e) Sink & decorative panels—"Perspex"
f) Desk—Formica laminates

Section 4—Describes the use of emulsions of polyvinyl acetate (55% solids) of Vinyl Products Limited of Carshalton, Surrey, England in conjunction with cement, fillers, and pigments for floor covering.

BRAZIL

REVISTA BRASILEIRA DE PLASTICOS

Vol. 1, No. 5-7, May-July 1953

Abstracter: Louis A. Helwich

VITAL IMPORTANCE OF PLASTICS IN EAST GERMANY (page 6)

(A translation from British Plastics.) Some new developments are reviewed, achieved in the last five-year plan. Experiments in using PVC in automobile construction are mentioned. New acid resisting materials of trade name "Igurit" is manufactured in Bitterfeld. Placril-D, and acrylic material for surgical and dental applications is reported.

A BRIEF HISTORY OF PLASTICS, Eric Jeanrenaud (page 8-10)

A brief account of the development of plastics from the early beginnings

ap[illegible]ea compounds is given.

TERYLENE, LAST WORD IN BRITISH SYNTHETIC FIBERS, (page 12-14)

A story of the development of Terylene told in few words.

PLASTICS IN BRAZIL (page 15)

A review of existing problems mostly of economic and commercial nature. The production of polystyrene molding compounds has grown so [illegible]ently so that even some exports to other Latin American countries and to Europe are possible.

ADVANTAGES OF PLASTICS FLOORS (page 22)

Generalities about plastic tiles and their advantages are discussed.

REBIRTH OF PLASTICS INDUSTRY IN WEST GERMANY (page 28-29)

A description of the Chemische Werke Huels and their products. They are Buna rubber, PVC (Vestolit), PVC-plasticizers (Vestinols), PVC-copolymers (Vilit, Gepolit), butadiene-styrene co-polymers (Lipolit, Duranit) and a vinyl-vinylidene chloride fiber "Vestan".

Vol. 1, No. 8-10, Aug.-Oct., 1953

PLASTICS IN THE FIELD OF TELECOMMUNICATIONS, (page 1-8)

A description of the operations of the Standard Electric S.A. in Rio de Janeiro is given. In 1952 110,000 telephone apparatus and 20,500 radio cabinets have been produced using phenolic and urea molding materials of domestic origin.

THE FABRICATION OF MOLDED OBJECTS AND OF MOLDS, Eric Jeanrenaud (page 14-20)

The field of compression molding is treated from a general angle, some details of presses and molds are discussed.

PLASTICS IN THE WORLD (page 22-23)

A review of news mostly from the United States. A notable new molding plant has been put into operation in Port au Prince, Haiti.

PLASTICS IN BRAZIL (page 24).

A review of domestic problems. The production of nylon is planned in Brazil. The production of saran-fibers is already established in Brazil. New companies in the plastics field are reported: Celanese do Brasil S.A. Fibras Quimicas, intending to produce synthetic fibers, especially acetate rayon, S.A. Geon do Brasil will start its activities late this year and will produce 225 tons of vinyl resins a month. The application of plastics in automobiles is reviewed. The following products are already manufactured in Brazil: Safety glass using polyvinyl butyral layer, Various molded accessories used as replacement parts. Adhesive tapes. Various gaskets. Special rayon strings for tires. The production of benzene is to be introduced in Sao Paulo by next year.

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DENMARK

PLASTIC

Vol. 4, No. 2, Feb., 1954

Abstracter: Erik R. Nielsen

GRILON POLYAMIDE PLASTIC W. Stiner.

This is the first of three papers discussing Nylon-type plastics, with special reference to Grilon, the Swiss equivalent of Nylon.

Grilon filled with graphite has a lower coefficient of expansion, but a higher thermal conductivity than the unfilled material, factors which are of importance for bearing applications.

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FRANCE

INDUSTRIE DES PLASTIQUES MODERNES

Vol. 6, No. 3, March, 1954

Abstracter: Hans Mayer

The edition is dedicated to the Lyon meeting of "Le Congres National des Syndicates de la Transformation des Matieres Plastiques."

On thermo-setting materials A. Chappus discussed transfer molding, stressing the advantages of closely controlled tolerances and longer mold life, pointing out also that generally between 5 and 20% more raw materials are required to do the job; on the compression molding of large pieces R. Haas declared that not technical difficulties but the question of amortizing expensive dies and the high cost of raw material prevent their introduction in markets with definite limitations. A. Diot discussed the standardization of compression molding dies, suggesting a proper division according to mold types, action desired, etc. and stressed the advantages to be expected from such a move. M. Plassoa gave figures on the effect of aging on thermo-setting molded specimens and demanded that raw material suppliers and molders should spend more effort in order to get more definite information and improve their respective products.

In the group discussing thermo-plastic materials P. Roesch described pin point gating in injection molding, describing the importance of proper relation of length and size of runners, pointing out the difficulties caused by the elevated temperature of the material at the time of entering the cavities and warned against using higher pressures in molding with pin point gated dies. M. Roybier describes various methods of vacuum metallizing, the types of pumps used for evacuation, the methods of vaporizing the metal, the application of a primary coat on thermo-plastic parts to prevent the elimination of solvents and plastifiers under the vacuum and the qualities to be desired of the coating material, and finally the final coating for the protection of the metallized surface. J. Pierson and M. Guillat investigate the question of accident prevention in injection molding, the first evaluating the human qualities required of a "safe" injection machine operator, the second investigating the necessary safety features of the equipment, pointing out that a large part of accidents is caused in changing molds or working on the machine itself and that the machine builders must make arrangements to eliminate or reduce these risks. The third group covered extrusion. G. Maillard discussed the problems of vinylite extrusion, stressing the difference in methods and type of extruders to be used for plasticized and not plasticized materials. A. Vial described the problems to be conquered in the extrusion of polyethylene film and pictured the type of screw and head which had to be designed for this job. P. Mingat covers the same problem for nylon, making a special study of temperature differentials in the progressive stages of the travel of the material through the extruder.

In the group discussing the forming of thermo-plastic sheeting J. Turgis stressed the advantages of using infra-red lamps for the heating of the material but pointed out that production difficulties are bound to arise because only one sheet can be heated at a time and that the temperature regulation of the heater is difficult when materials of different thicknesses have to be handled. C. Compagnon described the vacuum forming of plexiglass sheeting in a vacuum forming machine, showing the possibility of using either the cavity or the male part of the die for the forming of the molding.

M. Phelip described the different types of machines used for the joining (sewing) of thermo - plastic sheets, particularly of vinyl sheets and films. While the use of electronic machines has become more or less standard for vinyls, sealing under heat and pressure or heat-sealing by electric impulses is also possible, for certain thermo-plastic types of material even necessary.

SET SAIL
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GERMANY

DER PLASTVERARBEITER

Vol. 5, No. 1, January, 1954

Abstracter: Ernest C. Bernhardt

PLASTICS PROCESSING MACHINERY

Review of German molding extrusion and processing machinery. No new data is reported, and no new equipment is described. There are plenty of photographs, however, to give the reader an idea of the appearance of the German machines.

Vol. 5, No. 2, February, 1954

EPOXY RESINS IN THE ELECTRICAL INDUSTRY by E. Preiswerk

Review of resins, physical data and applications.

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KUNSTSTOFFE

Vol. 44, No. 3, March, 1954

Abstracter: Anne Schwend

ACCURATE PNEUMATIC MEASURING OF THE THICKNESS OF HIGHLY ELASTIC PLASTIC FILMS—by A. Dittrich.

Current control of plastic films presents the problem of measuring their thickness while the material is still viscous. This paper, which is an excerpt from a diploma thesis submitted in 1951, deals with the application of the so-called "Solex-method" or method of measuring the distance for this purpose. As far as firm surfaces are concerned, this method's main advantage is the elimination of any damage to the surfaces aside from the high accuracy and independence from the "feeling" of the controlling person. In turn, this advantage is nullified in case the surface of the layer hit by the measuring air jet is elastic or even half-liquid. The deformation of the films then caused at the point of measuring necessarily entails a change in flow data between the nozzle and the surface and, hence, a dependency of the results of measuring on the properties of the material. This latter context is the main subject investigated in this paper.

The solex apparatus used is principally the same as those commercially known, however, using a maximum overpressure of 1267 psi only. In addition, there is being used an optical device consisting of a Reuter lamp, the light waves of which hit the lens of a horizontally put-up microscope through a glass container. The deformation of the surface under influence of air jets from the nozzle of the solex apparatus can be watched very well through the eyepiece of the microscope.

Results obtained and their evaluation, the theoretical basis for the solex method, nozzle discharge values, mathematical calculation of the measurement of the modulus of elasticity lead to the conviction that the solex method is well applicable to the measuring of the thickness of cast layers of viscous liquids and plastics within the limits shown.

REDUCTION OF PLASTICS—by Dr. Hans Rumpf

The manifold problems in the reduction of plastics may be solved if stress and temperatures used are adapted to the elastic and plastic properties of the material to be ground. Since friction has to be eliminated to the greatest possible degree, reduction has to be effected thru pressure or impact. Before going into detail on the various kinds of machinery used, theoretical and practical results of the application of gradually increasing pressure or impact are investigated: Stresses created in the material, deformation, propagation of stresses throughout the test specimen with the speed of the elastic waves and their dependency on the amount of impact energy, volume, shape of specimen, point of impact exertion and direction, as well as the distribution of grains.

Hammer, centrifugal and cross beater mills for brittle plastics, rotary cutters for soft plastics, grinding mills working at low temperatures (with liquid N_2), use of cooling current for keeping the temperature in the grinding chamber constant, and other kinds of mills are discussed. The principal possibilities for grinding brittle, thermoplastic and rubber-elastic materials are aired and the problem of fine-grain grinding enlarged upon. Since all grinders tend to supply a certain variety of grains, any trial to deviate from this distribution causes difficulties, such as avoiding the appearance of fine powder upon production of granules. It is therefore recommended to attach separators (spiral separators) to the grinders which eliminate the fine powder thru screens.

ACTIVE WHITE FILLERS FOR THE ELIMINATION OF COLD FLOW IN POLYISOBUTYLENE—by Dr. A. Weihe

Prompted by observations of the reaction of silica in liquid organic stock and high polymers and the possibility of manufacturing rigid lubricants from machine oil plus silica, have led to influence the rheological reaction of polyisobutylene by the addition of silica, produced at temperatures above 1930°F. in the gas phase, aiming at an elimination of unwanted cold flow. Tests were made with 60 parts silica [illegible] parts polyisobutylene. Films drawn from this compound could be stretched to 1300% of their original length which was reversible to 800%. Tensile strength was improved to 1216–1422 psi, tensile elongation showed 380-450%. However, 10 to 20% silica filler added to polyisobutylene suffices to produce technically very interesting results: 100% reversability of elongation (350%), absence of water absorption which is inherent to highly silica-filled polyisobutylenes (dipping into isocyanates prior to watering will prevent water absorption, though), ease of processing and facilitation of obtaining entirely smooth films, factors which may otherwise be obtained by adding polyethylene, as is generally known.

Comparative tests demonstrated that the same effects could not be obtained when filling other plastics such as polyethylene, PVC with or without added plasticizer, or polyvinylisobutylether with silica; however, use of other metallic oxides such as aluminum oxide gained from aluminum chloride or titanium dioxide, ferric oxide or zinc oxide yield similar mechanical properties when mixed with polyisobutylene. Oxides produced in the gas phase are far more effective than others.

These results open new possibilities for the use of polyisobutylene as lining for containers, tank cars and insulators. The elimination of the cold flow, good resistance against water absorption, corrosive chemicals and most solvents make silica-filled polyisobutylene well suited for the coating of overseas cables.

STATIC CHARGES GAUGE.

K. P. Mundinger GmbH of Renningen Wttbg. put on the market a new gauge for the detection and gauging of static charges which has the size of an average-size photographic camera, works on a 3V penlight battery and weighs 0.7 kg. The low voltage prevents the formation of sparks upon switching on and off, nonetheless guarantees about 5000 measurements. Emission of the electronic tube used is brought about by the slightest static charges.

DESIGN OF INJECTION MOULDS by Hans Gastrow

This survey deals with the correct dimensions of sprues, runners and the various forms of gating. A number of charts, conversion tables and formulas gives the molder practical advice as to the relationship between diameter of sprues, length of runners and weight of molded part (small parts only). Part two of the article advises on the factors determining the feasible number of cavities.

ANNEALING OF INJECTION MOLDED PARTS.

Reprint from Dow Digest No. 14

CIRCULAR CUTTERS FOR STAMPING ROUND PARTS FROM LAMINATES—by Karlheinz Maylahn

It has been proven advantageous to stamp round parts up to 15mm thickness from laminates instead of using hand-saws. Large quantities of parts will permit use of circular cutters consisting of a steel tube with teeth at the lower end which are hard chromium-plated. Small quantities of parts must be cut by means of adjustable circular cutters. The thicker the diameter of the laminates the more difficult it is to fasten the knives so that they will stand absolutely straight without yielding like a spring. Circular cutting may be applied up to 30 mm thickness of the parts.

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GREAT BRITAIN

RUBBER and PLASTICS AGE

Vol. 35, No. 2, February, 1954

Abstracter: Samuel Wein

TYPICAL APPLICATIONS OF EXPOXY RESINS, pp 81-87, P. A. Dunn

"Araldite casting resin" (expoxy type) for hot and cold cures are reported with respect to their physical and electrical properties.

CASTINGS OF POLYESTERS, pp. 81-82 By Jaffrey Rowland

A survey of casting polyesters as practised in England by the author, describing technical difficulties experienced and techniques used to minimize or obviate same.

Shrinkage has been found to be between 6 and 7 percent. This is minimized by adding fillers (calcium chloride in this case) to the resin. Quantities up to 40 percent by weight of the resin used has been found to give satisfactory results.

Either methyl ethyl ketone peroxide or cyclohexanone peroxide with cobalt naphthenate with a minimum of exothermic action. The proportions of these may vary to suit the individual time required to set the mixture.

Silicones are used as releasing agents, others successfully employed are aluminum stearate gel, sodium alginate, polyvinyl alcohol, poly-tetra fluoroethylene, carnauba wax, paraffin wax, cellophane, polyethylene foil or paper.

Applications mentioned are: display and educational embedding of objects, potting of radio and electrical equipment, structural castings, sheets cast between glass plates with high degree of transparency.

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HOLLAND

PLASTICA

Vol. 7, No. 3, March, 1954

Abstracter: W. P. ter Horst

FUNDAMENTAL RESEARCH ON FRACTURE, P. Dekking, P. 138

Professor Smekal of Graz told at a meeting of the Plastics Research Institute about the interesting results which he obtained in the field of the fundamental reasons of fracture by careful examination of the fracture surfaces created after well defined fracture conditions.

His most important conclusion is that fracture is made possible only by inhomogenieties. It is obvious from his experiments that fracture always starts at an inhomogeniety, proceeds along inhomogenieties and that even a brittle material like glass is very ductile in its really homogeneous regions.

SOME NEW BASIC MATERIALS OF THE B.A.S.F. FOR THE PLASTICS INDUSTRY, F. Stastny, p. 120

Some new plastics, developed in the laboratories of the B.A.S.F.A.G., Ludwigshafen, are discussed, a.o. 4 types of "Giessharz P", unsaturated polyester resins for the manufacturing of formed products by casting in molds, for embeddings, fiber-glass laminates and molding powders.

"Emu-Pulver 120 F. D." A polystyrene-base powder for the manufacture of acquous dispersions which are used e.g. for coatings on wallpaper. "Styopor" a polystyrene-type, with a foaming agent, able for the manufacture of formed products. "Diofan 200 D" and "Diofan 300 D" aqueous polyvinylidene chloride dispersions used for coatings on packaging-paper preventing loss of aroma.

APPLICATIONS AND FOSSIBILITIES OF POLYESTER - RESINS, H. A. K. Eden, p. 112

In this article the author discusses the applications of unsaturated polyester resins from a technical-economical point of view. Casting resins, alkyd moulding compounds and polyesterglass-fiber materials are successively dealt with and much attention is paid to the necessary investments.

Cleminson Joins Catalin

Mr. William V. Cleminson has recently joined the staff of Catalin Corporation of America as Controller. Prior to Mr. Cleminson's association with Catalin Corporation he was with L. E. Waterman and Company for ten years as Assistant Secretary, Treasurer, and Controller.

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SPAIN

REVISTA DE PLASTICOS

Vol. 5, No. 25, Jan.-Feb., 1954

Abstracter: John B. Ballard

PLASTICS PAVILION

A notice and editorial matter announcing the Plastics Pavilion at the 22nd International Sample Fair, which will be held in Barcelona, Spain, from June 1 to June 20, 1954.

APPLICATIONS OF THE INFRARED SPECTRUM TO THE STUDY OF MACROMOLECULES, Dr. Antonio Hidalgo, Page 12.

A discussion of the uses of infrared in control and research.

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UNITED STATES

ELECTRICAL MANUFACTURING

Vol. 53, No. 3, March, 1954

Abstracter: Gerald Eisner

HIGH-TEMPERATURE RESISTIVITY OF POLYESTER DIELECTRIC FILM

Leonard E. Amborski and Robert L. Burton

The authors who work in the Yerkes Research Laboratory of DuPont discuss the resistivity characteristics of Mylar (Polyethylene Terephthalate) Polyester Film. Mylar is compared with Teflon, Saran, Kel-F, Acetate, Nylon and Vinyl Chloride with respect to resistivity under varying temperatures. Results of studies in varying the thickness of the film and the applied voltage are graphically shown.

One conclusion the authors arrived at was that the Log Resistivity of Mylar Film decreases linearly with temperature, decreasing about one order of magnitude for every twenty degree Centigrade temperature rise.

LAMINATED GLASS CONSTRUCTION WITH SPECIAL REFERENCE TO BOATS

by Cmdr. Arthur C. Bushey et al., U. S. N. Bureau of Ships, Feb. 26, 1952, 81 pages. Library of Congress Catalog Card No. 52-61907.

Abstracter: John J. Lamb

A complete discussion of present methods of making glassfiber polyester boats with descriptions of the Beetle, Marco-Muskat, and Winner methods. The Marco-Muskat method, using both vacuum and pressure on the resin, is considered best.

Fillers, resins, activators, making of molds, temperatures and times of molding, parting agents, honeycomb cores, and incorporation of ribs are described. In some cases the resin content was as high as 75 percent.

(please turn to page 81)

SECTION NEWS

Edited by

Stanley Bindman

Jamison Plastic Corp.
71 E. Sunrise Highway
Freeport, New York

Silicones in the Plastics Industry Described At New York; Rigid Foamed Silicones Are New

Arthur M. Merrill

The April 21 regular dinner meeting of the New York Section featured a talk on "Silicones in the Plastics Industry" by Bruce Thorsberg, Dow Corning Corp. Held at the Gotham Hotel, the meeting attracted an attendance of some 70 members and guests, and included a cocktail hour, dinner, and business session.

In reviewing the history of silicone plastics, Mr. Thorsberg said that their acceptance has been slow because of high material and handling costs, long cure cycles, and the fact that there is no silicone resin, as yet, that can be used to make unsupported film, clear castings, or solid non-reinforced structural parts.

Silicones in the plastics industry are available in three major forms; laminating and bonding resins, molding compounds, and rigid resin foams. The laminating resins are available in both low pressure (30 psi.) and high pressure (1,000 psi.) types; are laminated with glass or asbestos cloth; and are used in structural parts requiring high dielectric strength, and high strength at elevated temperatures.

Silicone molding compounds previously available required molding cycles of 20-30 minutes, the speaker noted. Dow Corning has recently developed a new compound that requires five minutes for molding, after which the parts can be removed while hot and do not require an after-bake. Suggested applications include electrical switch parts, and high temperature mechanical parts.

Silicone rigid resin foams are comparatively new materials that are highly resistant to thermal shock and high temperatures (700° F.), and can be foamed in place, Mr. Thorsberg stated. The properties of these foams suggest their use in fire wall structures, insulation, and heat stable buoyant structures.

In addition to silicone fluids and emulsions used as mold release agents in the plastics industry, other new developments in silicones are under way, the speaker announced. These developments include pressure-sensitive adhesives that retain their tackiness at high and low temperatures; fluids for coating certain plastics to improve their surface resistivity; and resins with improved compatibility that can be used as additives for polyester and epoxy resins to increase their moisture and heat resistance.

In the business session preceding the talk, Section president Harold H. Schwartz, Empire Brushes, Inc., announced the appointment of Arthur L. GeWertz, manufacturers' representative, to the board of directors for one year, replacing Richard M. Thews, Monsanto Chemical Co., who has been transferred to Springfield. Alan K. Zimmerman, Monsanto, was appointed chairman of the program committee, effective with the May meeting.

A guest of honor at the meeting was Joseph P. Healey, Manco Products, Inc., and national membership committee chairman, who spoke briefly on the Society's membership campaign. A report was also given by Herbert J. Weber, Rotuba Extruders, on the work of the Section's educational committee.

Table favors were distributed through the courtesy of Premier Plastics Co., and the meeting closed with a drawing for door prizes contributed by Leaf Plastics, Inc., and H. Muehlstein & Co. Door prize winners were T. L. Giudice, Diemakers, Inc.; A. J. Falkin, Metalmold Forming Co.; and F. M. Kafka, Superior Materials, Inc.

A total of 21 new members were added by the Section during the past month, as follows: Zeke Cooper, sales engineer, Ideal Plastics Corp.; Albert E. Cossette, owner, Stan-Cast Co.; William G. Dehmel, production engineer, Ace Plastic Co.; Harry T. Douglas, vice president and secretary, Lunn Laminates, Inc.; Stanley Goldman, production manager, Ideal Plastics; Carl E. Holmes, sales engineer, General American Transportation Co.; Frederick M. Kafka, technical representative, Superior Materials, Inc.; Roy L. Kern, salesman, Godfrey L. Cabot, Inc.; Marvin W. Kramer, department head, East Coast Aeronautics, Inc.; David Lennek, salesman, Rainville Co.; James S. Lunn, president, Lunn Laminates; John E. Lynch, Jr., salesman, Celanese Corp. of America; Roger W. Major, sales engineer, Plax Corp.; Sid Noble, assistant chief development engineer, Ideal Plastics; Howard W. Partridge, vice president, Victor Kellering, Inc.; Anthony E. Paxton, owner, A. E. Paxton Co.; Christy J. Runfola, technical representative, Koppers Co., Inc.; Robert M. Sak, assistant sales manager, Textiglas Division of Madagascar Graphite & Mica Co.; Adrian Wally, vice president, Electronized Chemicals Corp.; T. W. Walh, senior technologist, Shell Chemical Co.; and Bernard Weiner, chief toolmaker, Ideal Plastics.

St. Louis Topic Is Isocyanate-Ester Foams

R. S. McDorman

The St. Louis section of The Society of Plastics Engineers was very fortunate in having as guest speaker for the April meeting, Mr. Lester La Grange, manager, Isocyanate sales, Organic Chemicals Div., Monsanto Chemical Co.

Mr. La Grange gave a brief history of foamed plastics with their various applications and quantities used for each application. The methods used for making various foams were discussed with a live demonstration of the making of a flexible type Isocyanate Polyester foam.

Factors including capital, labor costs, special properties of Isocyanate foam, and the degree of variation were presented.

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"What the End-User Thinks of Plastics" Is Told To Chicago Section by Panel of Buyers

Lloyd E. Parks

Reading from left to right: M. A. Self—President, Logo, Inc. (President Chicago Section SPE); H. Zeller—Director of Styling, Motorola Corp.; W. Cheely—Purchasing Engineer, Zenith Radio Corporation; F. Low—Senior Development Engr., Electric Dishwasher Div., Hotpoint, Inc.; and R. K. Gossett—President, Gossett & Hill Company. (Vice Pres. Chi. Sec.)

"When our customers speak," might well have been the title of this excellent panel discussion. In general, the group was told what can be done to improve the role of plastics as materials of construction, and what has to be done to protect plastics against competition from older, long accepted materials.

Mr. **Frank Low**, Senior Development Engineer, Electric Dishwasher Division, Hotpoint, Inc. represented Engineering and stressed the following points as desirable developments in plastics:

Polystyrene:

1. A clear high impact polystyrene is needed for use in refrigerators and other appliances.
2. Lower degree of water absorption.
3. Better heat resistance for ranges, clothes driers, etc.
4. Reduced coefficient of expansion.
5. Better dimensional stability.
6. An anti-static polystyrene.

Phenolic Plastics:

Phenolic plastics in colors other than brown and black are highly desirable, and the development of a wide range of colors was encouraged. It was specified that such colors had good moisture and heat resistance.

Others:

Other plastics such as fiberglass reinforced polyester, vinyl, nylon, and urea-formaldehyde were discussed in less detail.

Mr. **Herbert Zeller**, Director of Styling, Motorola Corporation, represented Designing and made the following points:

1. Design and engineering have put plastics on the market through decoration.
2. Color is most important in the future of plastics and will become even more important with the coming of colored television.
3. Standardization of colors among suppliers with thought given to color harmony, rather than a random selection of color standards, was urged as an aid to designers.
4. Raw material suppliers and molders in the plastics industry must be concerned with the wishes of the ultimate consumer. Too often, the wishes of the consumer have been incorrectly considered the private worry of the appliance manufacturer.
5. Appliance manufacturers will give customers what they want in color and decoration and this should continue to increase the market for plastics. However, there is a matter of cost that cannot be overlooked and other materials such as painted metal and wood are already cutting into the plastic market while expensive molds stand idle.

Mr. William Cheely, Purchasing Engineer, Zenith Radio Corporation, spoke for Purchasing and spoke of quality, service, and cost as follows:

1. Reduced costs all the way back to the raw material suppliers were urged as a means of keeping plastics in production as competition increases.
2. Improved quality of plastic parts is necessary to meet demands, by the consumer, for higher quality products. Better quality control by molders was stressed as a means of eliminating rejects by end-users. Rejects at this point add to costs.
3. Phenolic plastic is an excellent material and would be much more widely used if it were available in a wide range of colors.

This was a well attended dinner meeting held at the Western Society of Engineers on April 21, 1954.

MARCH 17 MEETING

Dr. Johan Bjorksten of Bjorksten Research Laboratories, Madison, Wisconsin addressed the March meeting on the subject of "New Developments in Plastics." This was an excellent review of recent developments in plastics and the effect that such developments can have on the plastic industry.

OFFICERS

Officers serving the Chicago section of SPE for 1954 are:

President — M. A. Self, Logo, Inc.
Vice President — R. K. Gossett, Gossett & Hill Co.
Secretary & Treasurer — R. D. Hanna, Hercules Powder Co.

C. of C. Honors Plastics Industry At N.W. Penn.

Paul C. Roche

A very much talked about item among local plastics people was the Greater Erie Chamber of Commerce Annual Dinner on March 31, 1954. For this event the plastics industry in the area was honored. Don Leet, President of the Northwestern Pennsylvania Section of the SPE, moved in and co-ordinated this activity very capably with the plastics industry. A very representative display was arranged, supported by ten local plastics companies. This event was held in the East Erie Turners club rooms and was attended by over 500 people, approximately half of whom were wives who shared in the enthusiasm of this event. Dr. Kenneth McFarland of Topeka Kansas was the main speaker. He is Educational Consultant and Lecturer for General Motors Corporation. His inspirational and dynamic speech showed remarkable balance between profound and humorous references to keep his audience with him 100% at all times. There is no question that this dinner meeting served to remind the local citizenry that the plastics industry is a major force in our economy.

The regular monthly meeting of the Northwestern Pennsylvania Section was held at the American Legion Club House at Warren, Pennsylvania. The speaker was Mr. W. E. Smith, Salesmanager of Guy P. Harvey and Son Corporation of Leominster, Massachusetts. Mr. Smith's topic was "Stainless Steel Castings—Automatic Molding". This annual meeting at Warren, Pennsylvania is always an event to be looked forward to, especially on the strength of the fine support given the section by the members located in Warren.

Buffalo is Guest of Refrigeration Engineers For Talk on Use of Plastics in Refrigeration Equipment

R. W. Miller

The Buffalo Section was guest of the American Society of Refrigeration Engineers at the ASRE meeting, April 1st. The speaker was Mr. John Braught, Sales Engineer of the General American Transportation Co.

Mr. Braught outlined the use of plastics in refrigeration from prior to World War II to the present. Prior to World War II there were many obscure parts molded from phenolics. During World War II plastics were put into poorly engineered places due to shortage of the conventional material. He stated the plastics industry is trying to outlive this. It was stated that plastics are not to be considered cheap. Plastics people want them to hold their own for their own intrinsic value. As an example a plastic refrigerator door liner is more expensive than its porcelainized steel counterpart. However the cost to the manufacturer is less due to the absence of chipping which so frequently occurs on the porcelainized steel. In some instances plastics are handicapped. It is quite simple to repaint a place on steel parts, but little can be done to plastics when they have mars, etc. It was pointed out that considerable difficulty has been encountered in attempt to develop pastel shades in plastics. Following are listed various polymers and to what use they have been put in refrigeration.

Styrene or modified styrene. Styrene accounts for the largest part of the plastics used in refrigeration. It is used for door liners, breaker strips, chill trays and evaporator doors. As a door lever styrene serves as a structural member. At present GATX is molding door liners in halves because of limitations of their injection molding machines. Styrene when used for decorative purposes such as escutcheons are metalized. This vacuum metalizing involves deposition of metal particles on the plastics. In some cases color is achieved by backing up the transparent plastic with styrene foil. About one fifth of the total styrene production is used in the refrigeration industry. This amounts to some 60,000,000 lbs. per year.

Vinyl chloride—used for gaskets.

Acrylics — Acrylics are used for decorative purposes. Mr. Braught digressed and stated that acrylics are one of the more abrasion resistant plastics. He stated that acrylic gun blisters on planes used in the North African Campaign stood up better than steel on the tanks. At present the Ford Motor Co. is using acrylics for their Skyliner which has a transparent top.

Polyesters.—Polyesters are used in air conditioners because of their corrosion resistance.

Nylon. — Mr. Braught stated that most every roll out shelf on our more recent refrigerators is rolling on Nylon rollers.

Polyethylene.—Used for ice cube separators.

"Kel F" or "Fluorethene"—Being investigated for valve seats.

Thermosetting Resins.—Mr. Braught stated that the electrical industry has done a great deal for thermosets in the past 15 years, and the next 10 years should equal the past 15. He implied that the use of thermosets for television cabinets and washing machine agitators will lead to their being used more extensively for refrigerators and air conditioners.

It was announced at the meeting that Dr. P. L. Shanta, Supervising Engineer of the Carborundum Co, will be the SPE panel moderator at the Third Annual Technical Societies Council's Conference and Exhibit to be held in Buffalo, April 21st, at the Hotel Statler. The subject of the panel will be "Designing Plastics for Future Applications." Panel members will be Dr. R. R. McGregor of Mellon Institute, J. D. Nelson of the General Electric Co., E. E. Pschorr of the Ciba Co., Inc., and William Norum of the Bakelite Co.

Vacuum Forming of Styrene Sheet—South Texas

Lewis B. Connelly

Mr. Jack W. Mighton, Head of Sheeting Section, Plastics Technical Service, Dow Chemical Company, discussed "Vacuum Forming of High Impact Polystyrene Sheet" for the benefit of the South Texas Section in April. Mr. Mighton's talk was followed by a demonstration of the vacuum forming.

The meeting was held at Santa Anita Restaurant, Houston, Texas at 7:00 P.M. April 21, 1954. Our attendance was 32, including several out of town guests. Mr. George Laurenson, General Industrial, Marysville, Ohio was vacationing in Houston and attended as a guest. It is mighty nice to have a member from one of the other sections visit with us.

Mr. Mighton discussed cont[illegible] forming very briefly, the majo[illegible] tion of his talk being confi[illegible] starting with cold sheet.

The talk was augmented with slides to illustrate methods of v[illegible] forming. He discussed straight vacuum forming and drape forming. The drape forming is advantageous in obtaining uniform wall thickness.

Some of the materials from which short run molds can be made are gypsum cement, wood, and phenolic castings. Long run jobs do better with metal molds, incorporating cooling channels. In rapid production, dissipation of heat is important and is best accomplished through the use of temperature regulator devices, similar to those used in injection molds, Mr. Mighton said. The use of sprayed metal molds, having a metal thickness of 1/8 to 3/16 inches was also discussed. Such molds are usually backed by reinforcing such a polymer reinforced with glass.

Mr. Mighton gave a few rules for the design of vacuum forming molds. Vacuum holes should be no larger in diameter than one-half the thickness of the sheet except in the lighter gauge sheeting. The holes should be where the sheet will form last. The number of holes is dependent on the volume of air to be removed, but, in general, the more holes the better. Mr. Mighton also suggested very generous radii for all corners and a mold draft of at least 5 degrees.

Trimming of the sheet is done by sawing, blanking dies and several other methods. Destatising methods were similar to those used for any polystyrene part. The printing and application of decalcomanias to high impact sheet before and after forming was also discussed. Distorted printing such that the vacuum formed part has the desired finish coloring was illustrated by slides. The colors applied by this method are generally within 1/16 inches tolerance.

Mr. Mighton illustrated with color slides some of the many uses for vacuum formed sheeting. His talk was concluded with the demonstration of actual vacuum forming in a 12" x 12" press in which the SPE emblem was formed. Samples were given to all in attendance in various colors and thicknesses. Questions were answered during the demonstration.

Our May meeting will be on "Silicones in the Plastic Industry". It will be presented by Mr. Ted Goldman of the Dow-Corning Corporation. In June we expect all of the members and friends to turn out with their wives for our Annual Summer Party. The first Fall meeting will be held September 15. "Vinyls" will be discussed by Mr. Harold Holtz of the St. Louis office of Bakelite.

Molding of Polyethylene Interests Southeastern Ohio Section Meeting

William J. Stranathan

Approximately thirty members and guests attended the April 22 meeting of the Southeastern Ohio Section of the Society of Plastics Engineers in Zanesville, Ohio to hear Mr. Harold A. Holz of the Bakelite Company, a division of Union Carbide and Carbon Corporation give a very interesting talk on the molding of polyethylene.

Mr. Holz stated that polyethylene was first produced in experimental quantities during 1933. It was discovered that ethylene gas could be polymerized under the influence of high temperature and pressure to form a solid wax-like material. Linde Air Products Company at Tonawanda, New York aided much in the development of polyethylene in 1939.

Polyethylene is manufactured from natural gas. Methane, which forms a large part of the gas, must be removed and leaves a very small percentage of ethane, propane and other remaining constituents to be cracked to form ethylene, from which polyethylene is made by polymerization under extremely high temperature and pressure. Approximately 15 cu. ft. of ethylene are required to produce one pound of polyethylene.

Polyethylene may be fabricated by calendering, compression molding, injection molding, blow molding, extrusion and extrusion lamination.

This material requires no specially designed or plated injection cylinders, nor is mold plating required. Cylinder temperatures varying from 275 to 600 degrees F. are most commonly employed. Mold temperatures may run as high as 130 degrees F. but lower temperatures will serve to shorten the molding cycle and to minimize skinning, while higher temperatures are used to provide a higher gloss to castings.

Stiffness in polyethylene is accomplished by the use of fillers, such as carbon black and calcium carbonate.

Polyethylene applications may be divided as such: housewares, toys, bottles and industrial items. Squeeze bottles are proving to be a continuously expanding field, while housewares are by far the most important and consume a very large portion of this resin.

Mr. Holz also gave a very detailed description of irradiated Polyethylene. In this process a very moderate dose of high energy radiation such as alpha, beta or gamma is used. When this occurs radiation breaks some of the hydrogen bonds liberating hydrogen and permitting the formation of carbon to carbon bonds between adjacent molecules. This process makes polyethylene insoluble. Hot solvents will soften but will not melt it.

Mr. Holz concluded his report with the showing of articles molded of this relatively new material and an interesting discussion period followed.

Preceding the talk a business session and a very delicious steak dinner was enjoyed at the Windsor Steak House. The business session was in charge of President John Chomicz, General Electric Co., Coshocton, Ohio. Discussion was made on making the S.P.E. on the same level as other Engineering Societies. It was also announced that we have increased our membership by four new members, John Ondrejko, Frank Chute, Howard G. Loeffelman, Arthur Radelfinger. Keep them coming. "Active" members makes a section an "Active" section.

Newark Panel on Automatic High Speed Injection Molding Holds Record Audience

Denis J. Mullins

A record breaking audience of over [illegible] people, which included Society of Plastics Engineers members from the New York, Scranton, Lancaster, Pa., Detroit, Waterbury, Conn. and Cleveland Sections, attended the April 14th meeting of the Newark Section of the Society at the Military Park Hotel in Newark. The program featured a discussion on "High Speed Automatic Injection Molding" by a panel consisting of F. C. Means, Sales Manager, The Fellows Gear Shaper Co., E. P. Moslo, President, Moslo Machinery Co., W. Fleming, Standard Tool Co., G. W. Whitehead, Sales Manager, Improved Paper Machinery Corp., and W. E. Smith, Sales Manager, Guy P. Harvey and Son Corp. Islyn Thomas, General Manager, Newark Die Company acted as moderator.

The panel members outlined the economies which may be obtained through the use of automatic machines and pointed out that automatics allow faster molding cycles, labor costs are lower because one operator may handle 3 to 6 machines, machine maintenance costs and mold costs are lower and there are fewer rejected molded parts and, consequently, less scrap. Articles weighing up to 2 ounces should be molded automatically according to the panel, although many plastic articles in this weight range are molded by use of multi-cavitied molds on larger machines. It was pointed out that many articles such as small kitchen bowls and rigid containers may be more economically produced by use of a single cavity mold on a fast automatic machine. Because of the comparatively low cost of automatic injection molding machines and lower mold costs, automatics are excellent for low volume jobs as well as experimental work, the panel said.

The panel members noted that automatic injection molding machines have been in the field for a number of years, but they emphasized that today's machines are automatic in the true sense of the word. No longer need a molder fear severe damage to a mold because of flashing or because a molded plastic piece sticks in the mold. Improved safety devices now reduce mechanical error to a minimum.

The panel stressed heavily the necessity for giving more thought to good mold design in order to take advantage of automatic molding. It was pointed out that knock-out pins, for example, must be perfectly aligned so that no interference with the dropping of molded parts will occur after each cycle is completed. Careful observance of proper molding conditions for each particular type of plastic is also of prime importance to successful automatic injection molding according to the panel members.

A question period followed the discussion and inquiries concerning the use of weigh-feeding devices and pre-plasticizing units were, in conjunction with automatic molding, raised by several members in the audience. In answering these queries, the panel pointed out that weigh feeders will undoubtedly be developed in the future to be of definite advantage in automatic injection molding although they are of no particular advantage at present. Pre-plasticizers not only are unnecessary on small automatic injection molding machines because todays heating cylinders are sufficient for uniform pre-plasticizing of materials, but the costs of present pre-plasticizing units are almost equal to the cost of the smaller injection molding machine itself, the panel stated.

Table favors for the meeting were donated by Plastic Molders Supply Co. Door prizes were donated by Gering Products, Sterling Plastics and Industrial Synthetics Corp.

SET SAIL FOR
ATLANTIC CITY
SPE Eleventh Conference

THE *Injection* MOLDERSCOPE

By A. R. Morse

President, Injection Molder's Supply Co.

"It is the freedom to disagree, to quarrel with authority, in intellectual matters to think otherwise, that has made this nation what it is today." Dr. James B. Conant

PRESS CHANGES IN '54

The sharpest molders I know are apparently going awfully slow on press committments so far this year. Why? Because changes and improvements in presses are now coming faster than they have in many years. The impact of recent improvements in molding powders didn't spur the press makers to improvements with anywhere near as much spice as sharpened competition has. When a press maker begins to see presses sitting on his floor instead of being grabbed by molders, all sorts of reactions take place. Engineers are asking for suggestions. Indeed, 1954 has been a fascinating year for the observer of the machinery picture so far. It's a good time to buy if you need a press badly. But many shops are holding off till they see what hard times does in the way of press improvements. You won't see much lower press prices this year at least, as too much inventory is on hand and it will be many, many months before Wheelco, Vickers, and other such suppliers of press components feel the impact and the downward price spiral can begin — if it ever does! Used presses have been dropping off sharply since last summer, with recent offerings almost 40%-50% under a year ago and many "feeler" lists are being issued by machinery dealers asking for offers and listing presses not actually for sale just to keep interest up and see what molders will offer.

O FOR A WRITER'S LIFE!

I received two letters in connection with a recent column that clearly show the dilemma of being a columnist in the SPE JOURNAL. One letter read "There are so many untruths contained in the article it is hard to understand how you can get away with it." The other letter read: "I want to compliment you on the article, mainly for the fact that it is factually true!" Our readers may be assured that I try to document everything, and to present all of the facts fairly. The trouble is you just can't please all of the people all of the time, and no two people have the same viewpoint, as the foregoing questions show.

AN APOLOGY

The MOLDERSCOPE wishes to apologize to the A. J. Desimone Co. of Paterson, New Jersey, for omitting mention of their Normalator in our February issue where the development of the mold temperature regulators was reviewed. I have kept a complete historical file on the various circulators over the past 14 years, but in writing my review, I overlooked this one somehow — in fact, my file is missing on it. The Normalator appeared after the Thermolator, around 1947, and utilized conventional pumps and heaters. Cooling, however, was accomplished by means of a fan and finned coils—the only circulator ever to attempt this. It was most widely sold in the New York area.

Milwaukee Host To National Council Meeting Gordon Seiter Talks On Vacuum Metallizing

Marvin C. Stowe

The Milwaukee section of the Society of Plastics Engineers enjoyed Mr. J. Gordon Seiter's very enlightening speech on "Vacuum Metallizing." Mr. Seiter is Manager of the Metallizing Department of the F. J. Stoke's Company. To aid Mr. Seiter in his lecture and also to answer any questions concerning Stoke's new automatic compression and injection molding machines Mr. Steward Helliwell was on hand.

With the aid of slides Mr. Seiter covered the entire process of "Vacuum Metallizing" of plastic parts. It was very interesting to learn of how they achieved the proper air pressure in their vacuum chambers. We also learned of the various problems that one is confronted with in "Vacuum Metallizing" in respect to various plastic materials. We were also informed on the various solutions regarding these problems. Along with the logic behind "Vacuum Metallizing" we were told of many practical applications. Probably one of the most frequent applications of "Vacuum Metallizing" is in connection with your costume jewelry.

Upon completion of the lecture one could see the economy to the manufacturer in "Vacuum Metallizing." More and more practical applications of "Vacuum Metallizing" are proving this economy each month.

Also on April 13, 1954 a National Council Meeting of the Society of Plastics Engineers was held in Milwaukee, Wisconsin. Thus, the Milwaukee Section of the Society of Plastic Engineers was honored with the presence of Mr. P. J. Underwood, National Secretary and other National S.P.E. officers at the evening dinner meeting. We hope that Mr. John LaBelle, President of the S.P.E., and Mr. Joseph Healey, National Membership Chairman, Mr. Underwood and the others enjoyed their visit to Milwaukee as Milwaukee enjoyed their presence.

In conclusion we thank the National Office for the honor of having the National Council Meeting in Milwaukee and the National officers for their presence at our section meeting. We also are thanking Mr. J. Gordon Seiter for his wonderful lecturing and timely humor. Last but not least our gratitude goes to Mr. Steward Helliwell.

Again I can report that 40 members and guests of the Milwaukee section of S.P.E. enjoyed an educational as well as pleasurable evening.

Philadelphia—"Tooling Up for Plastics"

John E. Raven

The combined SPE-SPI April meeting was held at the Franklin Institute on April 27th. The formal meeting was preceded by a dinner attended by 90 members in the Institute's "Dairy Dell."

Our honored guests of the evening were Messrs. W. H. Kemper, Geo. J. Schad and Joseph S. Pendleton, Jr. all of the Service Engineering Dept. of the Carpenter Steel Co. Reading, Penna.

Mr. Kemper has had 30 years experience in the Metallurgical field and acted as moderator for the technical portion of the meeting. A paper was presented on "Plastic Mold Steels." The talk was illustrated with slides showing the specifications and applications of the many mold steels manufactured by the Carpenter Steel Co.

After a very enlightening talk the meeting was opened for general discussion. This brought a lively question and answer period from which all present benefited.

Miami Valley Watches G.M. Make Steering Wheels

Martin Kasch

Miami Valley Section of S.P.E. enjoyed a trip thru parts of Inland Mfg. Division of G.M. Corp. April 1st.

Joe Overwein, Supervisor of the Plastics Lab. and program chairman of Dayton area of Miami Valley Section, together with other plastics engineers Mel Roode, Ray Adams and Murray Millhouse served as guides and explained the various molding and finishing operations.

The group was first given a look at the new Plastics Lab., and then treated to dinner in the cafeteria. Thanks to the management of Inland Mfg. and Joe and his associates.

After dinner a short business meeting was held for reports and announcements of future meetings. The tour then continued thru the plant. A number of different items were seen, but the main attraction was steering wheels. The operation was shown and explained from start to finish. The metal rings were formed and welded and then molded in various colors and styles.

The annual golf and picnic meeting scheduled for June 4th at Terrace Park Country Club has been changed to The Hartwell Country Club in Cincinnati.

A sad note was struck when Frank Strobino announced the death of Joseph J. Fiedler, vice president of F & F Die Works, in Dayton. Joe, a member of Miami Valley Section had done much, together with his associates for Miami Valley Section. He died March 29th and was laid to rest April 1st the very day of our meeting. Officers and members of Miami Valley Section extend their sympathy to his family and to his brother, John, and his son, Otto who are also members of Miami Valley Section.

Automatic Molding Advantages Shown To Western New England

C. W. Petersen

There are "seven critical areas of productivity" where automatic injection molding shows important advantages over conventional injection molding, according to Frederick C. Means of the Fellows Gear Shaper Company who was the main speaker at the Western New England meeting on April 7. Mr. Means, who accompanied his talk with a slide presentation showing various types of automatic injection molding machines, also pointed out the limitations of automatic equipment. Following his talk, Mr. Means joined Sherwood Young, Vice President and General Manager of the C. F. Church Company, and Edward Vaill, Technical Service Representative of the Bakelite Company, to form a question and answer panel on the general subject of automatic injection molding.

Mr. Means listed these areas of productivity where automatic injection molding brings improvements:

1. Down Time
2. Cycle
3. Direct Labor Cost
4. Shrinkage
5. Scrap Grinding
6. Molding Machinery Efficiency
7. Tooling

The chief objections to automatic molding cited by Mr. Means include possible damage to the mold, machine jamming, the problem of degating, scratching or distortion of molded parts by dropping, necessity for post treatment, need for family molds to avoid sorting of dissimilar parts, and scrap handling.

PLASTICS AROUND THE WORLD

(continued from page 75)

but the finished boat was satisfactory. Corresponding low flexural strengths were only 10,000 to 14,000 psi. Tests were also made on screw-holding strengths and on T-beams of glass-polyester. T-beams loaded on top were twice as strong as tested inverted. Beams of 1 2"x4" stem and flanges of 5 16"x15" tested on a 7 ft. span broke at 4000 lb. load on the center of the span.

The authors advocated the use of cellulose acetate honeycomb and epoxy adhesives for attaching fittings. Details were given of how to correct dry spots on the molding and how to make repairs to the laminate. The authors were enthusiastic about this application of polyester-fiberglass.

Silicones Described At Buffalo Section

R. W. Miller

The Buffalo Section of the Society of Plastics Engineers met April 23, 1954 at the Park Lane Restaurant. The subject of the meeting was Silicones. The topic was very well presented by Mr. J. J. Wilson, Sales Engineer of the Dow Corning Co.

The Silicone industry had its birth when the Corning Glass Co. felt there was a need for material that would coat glass cloth and provide better dielectric and heat resistance properties. Dr. McGregor began his work on Silicone fluids. This gave rise to the Dow 200 series. In 1941 Dow Chemical and Corning Glass Co. formed what is now known as Dow Corning. Following are several of the many different types of silicone materials and a brief description of each.

Silicone Laminating Resins

Considerable business has developed in this type of material. Below is a table listing properties of silicone laminating resins and conventional materials.

Perusal of the data indicates that silicone laminating resins possess unique properties. It should be noted that silicone laminates have a rapid loss in strength at initial exposure to heat but either regain strength or maintain strength over long exposures.

Silicone Molding Powders

Molding powders can be compression or transfer molded. An interesting application was discussed by Mr. Wilson. This involved molding heads for guided missiles out of silicone resins. This was necessary because the light weight metals initially used lost strength because of the heat generated by friction when the missiles traveled at high speeds.

(continued on page 82)

SILICONE PROPERTIES

Property	Low Pressure Silicone	Hot Pressure Silicone	Low Pressure Polyester	Low Pressure Phenolic	Aluminum	Magnesium
Flexural Strength						
Room Temp.	45-47000	27-32000	45-55000	44-66000		
½ hour at 500°F	5000	12-15000	35000	11-50000		
200 hours at 500°F	19500	12-15000	11-25000	9000	9000	
Tensile Strength						
Room Temp.	26-3200	35000	33-36000	22-27000	50-65000	39-42000
½ hour at 500°F	8-10000	22-25000	30-32000	24-29000	7-13000	8000
200 hours at 500°F	18-20000	20-22000	9200	11-15000	5- 9500	6000
Arc Resistance						
Seconds	300	350	185	165		
Constant	3.9	4.13	4.0	4.31		
H.O Absorption	0.21	1-1.3	2.0	9.0		

Problems in Product Development Engineering Told To Southern California

Walter H. Kadlec

The Southern California Section was host to Mr. Charles Gretz, Chief Engineer of Revell, Inc., at the April meeting. Eighty members and their guests heard Mr. Gretz discuss "Problems in Product Development Engineering." During the past few years his company has gained national recognition as a manufacturer and distributor of hobby kits based on realistic models of naval vessels, military aircraft and early editions of the modern automobile.

The development of products from conception to point of sale as a function of the product engineer in the plastics industry was the theme of Mr. Gretz's talk. He traced in detail the steps necessary to make a saleable product starting first with ideas for items that will have sales appeal. In the field of proprietary construction kits research plays an important part. Sources such as museums, manufacturer's blueprints and innumerable photographs must be carefully examined to maintain important detail without sacrificing authenticity at the expense of economical production.

From the prototypes which have become works of art the multiple cavity molds are made. The die blocks for the battleship "Missouri" model contain over sixty cavities and a new model "premiered" at this meeting has over one hundred cavities in a single shot. Revell calls upon die-shops throughout the country to obtain the unique tooling that intermixes steel and beryllium copper cavities, some machined, others hobbed.

Packaging and distribution schedules must be counted with the delivery of tooling and raw materials so that inventories are not overburdened as production commences. Because geographic distribution of the kits is important to the jobbing companies, large warehouse facilities are necessary for high bulk packages. Such measures assure many cities of simultaneous releases usually tied in with local and national advertising.

Choosing a line of products that has universal appeal without regard to season is of prime importance as it eliminates gross fluctuations in production and attendant personnel problems. The steady increase in the Revell facilities bespeaks a job well done as did the applause Mr. Gretz received when he had finished his talk.

Buffalo (cont'd. from page 81)

Silicone Foaming Resins

Silicone foaming resins are heat stable, have low water absorption and can be foamed in place. These resins can be expanded to a density of 8-24 pounds per cubic foot. Heat distortion is negligible after 20 hours at 700° F. An interesting application was their use in insulating the exhaust pipe on army tanks.

"Silastic" or Silicone Rubber

Development of these semi-inorganic rubbers has been very rapid. Normally requiring heat for vulcanization, they are now also available in a two component system that will vulcanize at room temperature. They have a working range of 4 hours. They have found use as molds for epoxy resins. This type of mold allows the molded article to be popped out of the mold in a manner similar to ice cubes out of a tray. Molds made of this material will withstand 400° F continuously.

Silicone Mold Sprays

These materials have found considerable use in the tire industry. It readily wets metal to form a parting film that improves plastic flow and prevents sticking of organic rubber and plastics. It will not decompose to form a carbonaceous deposit at any temperature.

Silicones as a Pharmaceutical

Silicones have found use in hand creams. A typical formulation is 50% silicone and 50% filler. This material possesses good resistance to water, phenolic and urea resins.

Bamburger Tinsel Flake Powder

"Confetti" is the new trade mark assigned by AMERICAN MOLDING POWDER AND CHEMICAL CORP. to their large size tinsel flake molding powders, formerly sold under the name of "Stardust." Available now for the first time are multicolor tinsels in the "Confetti" line. Extremely pleasing and striking effects are achieved by these multicolor tinsels which may consist of various metallic colors in Cellulose Acetate, and metallic as well as bright colors, such as red, blue and green, in Polystyrene. Various combinations of effects can be achieved and AMERICAN MOLDING POWDER AND CHEMICAL CORP. will develop special "Confetti" effects to fill customers' requirements.

AMERICAN MOLDING POWDER AND CHEMICAL CORP. will show their new "Confetti" line for the first time at the Sixth National Plastics Exposition which will be held in Cleveland, Ohio from June 7 to June 19, 1954. Not only will the raw materials be shown, but there will also be a display of products made from "Confetti" Polystyrene and Cellulose Acetate. For further information and samples, please address the manufacturer, AMERICAN MOLDING POWDER AND CHEMICAL CORP., 50 Bedford Ave., Brooklyn 6, N. Y.

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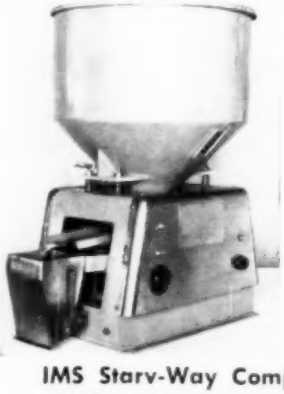

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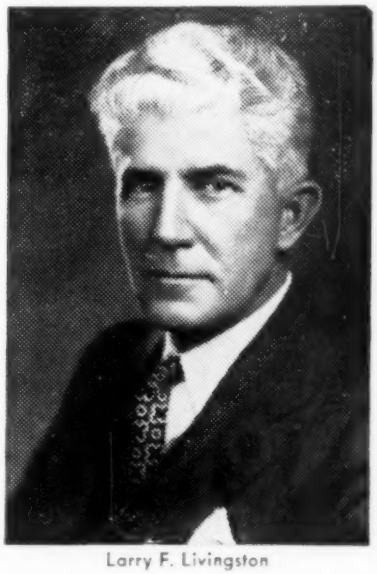
Cost Control Is Discussed At Rhode Island Section Meeting

Stephen Kalarian

The closing session of the R. I. and S. E. Mass. section of the SPE will have as its guest speaker, Mr. Larry F. Livingston, manager of the Extension Division of E. I. duPont deNemours and Co. Mr. Livingston's topic will be "Progress in Better Living" which covers the newest developments in chemical research. He will also tell of such better known things as nylon and cellophane and how they contribute to a better standard of living.



Larry F. Livingston

This closing May session will also be Ladies Nite for the spouses of SPE members. This means free dinners for the women and a more enjoyable evening for the men.

At the April meeting the R. I. Section presented Mr. Frank Straker, cost accountant of the General Electric Co. at Taunton, Mass. His talk on "Cost Control" covered the elements of cost and the application of costs in arriving at a piece price for a plastic part. The component parts of cost he stated, were direct labor, direct material, overhead, and miscellaneous costs. In particular, since indirect manufacturing expenses were difficult to determine accurately, he said that the machine-hour basis is probably the best way to compute this overhead expense.

The second speaker for the evening was Mr. G. Stanley Berge, Manager of the Taunton General Electric plant. "Quality Control" was his subject, which he handled deftly and presented in a very clear fashion. He said that there are three ways to handle plastic parts for export from a plant: a. Inspection; b. Sorting; c. Quality control. In reference to quality control the necessary Frequency Distribution Curve was discussed along with its Standard Deviation. He emphasized that a constant deviation from the normal curve could definitely be traced to a particular source of trouble. This production of parts outside the normal expectation, he said, could be attributed to any one of numerous sources; i.e. from a change of material from one batch to another or from different speeds of operation from one molder to another. In summary he said the aim of quality control was to lessen the scrap and hence lower costs. His personal aim is to eliminate departmental inspection entirely. In this we all join in a sympathetic but doubtful Amen.

The business portion of the gathering covered the announcement that two new directors were named: Mr. Casimer Plasewicz and Mr. Myles Powell, one of duPont's technical sales representatives. Mr. Powell is also the Chairman of the membership committee.

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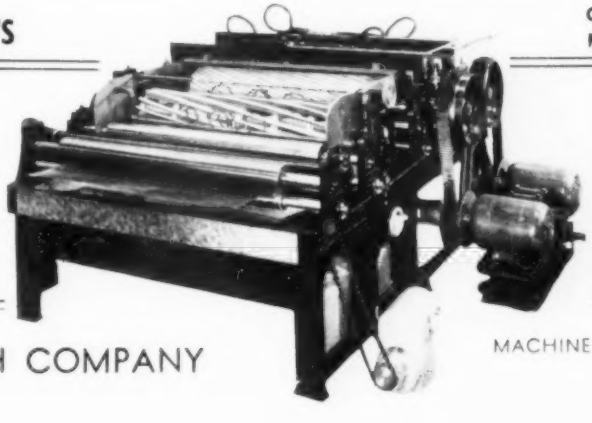

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Extrusion Die Design

(continued from page 17)

main together as a mass. However when the road down which it is traveling becomes longer for part of this mass than it does for an adjacent part, the velocity of that part of the fluid with the greater distance to go must increase. Should this hypothetical venturi be the extrusion die orifice, the increase in fluid velocity becomes apparent outside the die, just where it contributes to shape distortion or produces an unmanageable glob.

LENGTH OF DIE LAND

It is worth noting here that the die land length greatly alters this explanation. It is well understood that a longer land, particularly where a thicker section of an extruded shape is passing through the die orifice, will help retard what otherwise might be a very heavy flow at this point due to the extra surface friction. It is my intention to show that it is easier and far more economical to design and correct desired shape errors by enlarging or decreasing the actual die orifice opening and not by altering the die land length which is principally accomplished by altering the orifice rear approach paths. Many extrusion engineers having this difficulty just keep on altering the die orifices and approaches until some sort of success results.

I have spoken to many of these engineers of long experience who take pride in saying that they have made many dies and have yet to make one start right off directly out of the machine shop first trial! If you cannot get a desired section shape without several trials, there is something wrong with the entire set up. As I have previously stated, you will not experience burning if the die orifice is approached slightly oversize and straight away. It takes just a little mental visibility to see the possibilities in this flat plate type of die design. For instance, if a larger section than the extruder bore is required, simply introduce a flat plate spreader to another flat plate approach to the flat plate die orifice. Where excessive dead end areas are encountered, a slight angle of ½ degree or even less if it is uniform can be cut into the back side of the die orifice plate in the approximate projected area of the approach.

The simplest and last part of the basic die design system is the clamping ring. As illustrated it is a plain ring through which an opening has been cut, combining the extremities of our largest circular and slotted types of die bases. Another incidental, avoid counterbores in production extrusion tools wherever possible, it is an added expense and many times causes delay in disassembly particularly where the counterbore almost fits the head diameter of socket head cap screws.

Tubes and cored shapes are just as simple. Again a single plate is inserted in the pack behind the die plate. This plate acts as a web and supports the coring shapes, which to the contrary, should be streamline and comparatively long landed. Sizing or inflating air pressure is easily designed in at this point through straight drilled holes. It also should be borne in mind that a simple holder for these plates may be necessary when such shapes as refrigerator door gaskets are being extruded. Adjustment screws are located in this holder so that they contact the edges of the desired plate thereby enabling the operator to alter the relationship between the outside shape of the extrusion and its cored shape.

A conclusive thought about good basic design, which directs a comparison of design factors involved between designing so-called economical shape extrusion dies and costly production dies such as large sheeting dies becomes most obvious when we consider the fact that all three large sheeting dies in production at Auburn Button mount directly to the largest slot shape of our standard die base design here considered. It is of further interest to note that polyvinyl chloride, polyethylene, polystyrene, methacrylate, cellulose acetate, cellulose acetate butyrate and ethyl cellulose all extrude with near equal proficiency from this same basic design. Land length is optional. Select length more or less in proportion to the thickness of the desired section: thick section, long land—thin section, short land.

The purpose of this paper has been to present a basic concept for dependable design to those who recognize the need for more direction in their tool design. Everyone has difficulty regardless of what you hear and no design will substitute for a good extrusion engineer. He may excel as an idea man, a good designer, a good detailer or what have you. A man can have any one or even all of these merits and abilities, but there is one thing we must all have in order to survive and be a success at anything. We must respect the rights and opinions of the individuals we have to associate with each day. A good extrusion engineer has his machine operator behind him. He must have the respect of the machine operator in order to find out what's wrong. An extrusion machine operator should be selected for his intelligence and general ability. It is important for an extrusion engineer to be considerate of the operators' or even the helpers' suggestions. You will not be remembered as the genius who first predicted this particular difficult extrusion as you will be remembered for being a good joe.

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Southern" Section Joins As Thirty-Fourth SPE Section

C. Veazey LeCraw

The newly-organized Southern Section held its first official meeting on February 25, 1954, at the Briarcliff Hotel in Atlanta, Ga. This meeting climaxed several pre-organizational meetings of a group of people interested in the present and future of plastics in the Southeast. Mr. Joseph P. Healey, National Membership Chairman, was kind enough to fly down from Buffalo, N. Y., to be with us for our first meeting. Mr. Healey gave a very interesting and informative talk describing the organization, activities, and objectives of the Society of Plastics Engineers. Very few of those present had ever had any contact with the S.P.E. since the Southern Section is the first chapter to be organized in the Southeast, and hence many questions were answered by Mr. Healey.

There has long been a need for an organization in the Southeast to further the knowledge and promote an understanding of the tremendous potential of plastics. Through the tireless work of Raymond W. Kruse of Rohm and Haas Plexiglas Department, the Southern Section was born and is growing rapidly. At the end of January its pre-organizational rolls showed twelve members of S.P.E. to work with. By the end of February, its first month of existence, there were thirty-six members on the roll. It was felt by all concerned that the long existing need had been met.

Officers elected at our February meeting were Raymond W. Kruse, President; Jules W. Lindau, III, Southern Plastics Co., Vice President; Harold J. Torgesen, Gladwin Plastics Co., Secretary; and Robert K. Price, R. K. Price Co., Treasurer.

Elected to serve for three years on the Board of Directors were Raymond W. Kruse, Harold J. Torgesen, and C. Veazey LeCraw, Lockheed Aircraft Corp.; for two years, Jules W. Lindau, III, Leo J. Diamond, Koppers Co., and Richard Linneman, Gladwin Plastics Co.; and for one year, Robert K. Price, Donn E. Skoog, Du Pont, and Harry W. Hagmeier, Owens-Corning Fiberglas Corp.

There was a fine spirit of enthusiasm exhibited at the meeting at which there were forty persons in attendance. Committees were appointed to work on membership, publicity, projects, etc. Dinner meetings will be held on the second Monday of each month.

Our second meeting was held on the night of April 12. Colonel Blake Van Leer, President of the Georgia Institute of Technology, gave an interesting talk in which he described some of the background of plastics development and expounded on the tremendous future of the industry. He told of the three basic fundamentals needed to succeed in the plastics industry as well as in any industry. These are education, logic, and integrity. Colonel Van Leer's talk was well-received by the organization. For our May and June meetings we will have members of our own Section give talks on their particular phase of plastics work. Mr. Jules Lindau of Southern Plastics Co. in Columbia, S. C., will talk at our May meeting. Our June speaker will be announced at a later date.

SOUTHERN SECTION BOARD OF DIRECTORS

Left to right, Front row: Jules W. Lindau, III, Vice President; Raymond W. Kruse, President; Harold J. Torgesen, Secretary; Robert K. Price, Treasurer. Back Row: C. Veazey LeCraw, Richard Linneman, Leo J. Diamond and Donn E. Skoog.

Western New England

An all-day golf outing and dinner dance is being scheduled for Wednesday, June 2, at the fast-greened Farmington Country Club near Hartford, Conn. for members of the Western New England Section and their wives. Edward Sweeney of the Rogers Corp., co-chairman of the annual event, is planning the program.

Golf on the rolling fairways will be the main attraction during the afternoon, with the first foursome teeing off at 11:00 a.m. Arrangements are being made for mixed foursomes.

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Dear Friends:

Several persons have told me that they read these little messages that are written to you every month. Some have also asked whether they are from my pen or whether a "ghost writer" thinks up the ideas. I plead guilty and am fully responsible for the views expressed.

Last month I included a Latin phrase in my letter. I am not a Latin student so my interpretation may have been a "horse of another color." You may wonder why I used the phrase. Well, here's how it happened. I was considering a message to you and decided to open a certain book at the exact spot where the phrase was defined. The event or action which did the most interesting part at that particular place?"

My belief is that each of us is guided by a DIVINE power. Since I do believe this to be true I always feel sure that I can profit by that guidance as it is given. We try to model our business in harmony with that guidance and in part in accordance with the Golden Rule and the Sermon on the Mount. If you haven't read either of them lately may I suggest you read, especially the latter, including the first half of the Gospel according to St. Matthew.

Respectfully yours,

Wayne I. Pribble

Decorative and Protective Finishes for Plastics Are Described for Western New England

M. G. Snyder

"Consider the finish before you start," was the advice given by John Ostock, laboratory director of Standard-Toch Chemicals, Inc., to 62 members of the Western New England Section at a May 6 dinner meeting held at the Villa Rose restaurant in Windsor Locks, Conn.

Speaking on "Decorative and protective finishes for plastics," Mr. Ostock gave an enlightening account of some of the problems confronting paint and surface coatings manufacturers in developing suitable finishes for plastic items. "Plastic finishes," he said, "present all the problems encountered in metal coating, plus a number of additional variables and complications."

He added, however, that so many possibilities exist for cutting costs at the point of finishing that much additional study is justified. "A lot of money is being lost right at the spray booth in many plants," he said "because not enough attention is given to such factors as economically-designed surfaces, spray equipment pressures, drying cycles, and so forth. All these factors affect paint consumption."

Mr. Ostock pointed out that in most finishing operations it is common to try to step up drying or baking time to increase production. "This is like trying to step up the production rate by speeding up the molding cycle. Unless you change materials specifications, you usually find yourself dealing with cycle-seconds or, at the most, minutes."

But attention to gauges, temperatures and pressures, he said, is the first step toward success.

"In plastics finishes, the big bogey is the mold release agent," Mr. Ostock explained. "The more effective they are at releasing the part from the mold, the more effective they also seem to be at preventing adhesion of paint to its surface. Silicones are especially difficult in this respect since they resist most of the detergents and solvents that can be used on plastics.

"If you want to decorate," Mr. Ostock continued, "my advice is to stay away from release agents altogether if you can. If this is not possible, hot water and detergent seems to be the most effective remedy. It is necessary to keep changing the water often, however, which can run into a costly nuisance.

"Why hasn't a lacquer been developed to overcome release agents? Or why hasn't a compatible release agent been developed? Work is being done in both fields, but progress is slow. Certain release agents work fine on some jobs and fail on others. The same is true of some new paints and lacquers. Both have a history of phenomenal successes followed by dismal failures. For example, there is one classic case where a new lacquer was found that had a hard, high gloss finish. A great quantity of molded items were processed with it, and four months later all the lacquer peeled off causing a huge loss.

From the standpoint of volume as well as difficulty, Mr. Ostock stated that styrene has an undisputed hold on first place. The two main stumbling blocks in developing a suitable coating system for styrene, he said, results from the fact that (1) temperatures over 140°F. are pretty much prohibited and (2) styrene's vulnerability to solvent action.

"The importance of these two factors can be better understood if you realize that paint — whether a lacquer, a baking synthetic or an oxidizing type — is essentially a liquid vehicle with an evaporating solvent that conveys colored pigment in dispersion. By limiting the paint manufacturer to a relatively small number of solvents, you also limit the number of combinations possible and the type of pigment admissible.

"This restriction is made worse by the fact that certain permissible solvents evaporate too fast in spray work, or else cool too rapidly while airborne on the way to the surface to be coated. It really is a hit-or-miss proposition.

"It is possible to produce lacquers so inert that styrene items can be dipped in them with no bad effects," Mr. Ostock continued. "Unfortunately," he said, "these liquids are either such poor solvents or else dry so exceedingly slow that they are ruled out of the question as a paint vehicle.

"Similarly, good heat-convertible finishes are available, but these too are pretty much out of the question with styrene.

"A few catalyzed finishes with a phenol-formaldehyde base are available that bake out at low enough temperatures to be used on thermoplastics. They will dry fairly fast to a hard, glass-like finish, but they do not have the durability or wear resistance of the high-temperature baking types. A serious disadvantage of the catalyzed finishes is that they must be catalyzed right at the spray booth location by the operator. The degree of brittleness and adhesion is determined by the proportion of catalyst added and, of course, great care must be exercised since a mistake can really lead to serious trouble. Unless absolute control is possible, catalyzed finishes present a degree of risk that must rule them out."

Mr. Ostock pointed out that one of the primary differences between plastics and metals is that the former, styrene particularly, cannot be etched in the way that metals can be etched to improve adhesion of the coating. The crazing that can be produced on a styrene surface, he said, does not increase adhesion. Under a microscope, it can be seen that a crazed surface does not consist of the jagged edges characteristic of etched metal but of smooth, rolling contours. "In fact," he added, "a crazing element will actually reduce adhesive action because two incompatible materials are combating each other." Sand blasting, he said, is perhaps the only way to achieve a surface in plastic similar to etched metal.

Referring to so-called "sandwich coatings," Mr. Ostock said that whenever more than one coating is applied to plastics, the possibilities of disastrous results are multiplied. "The migration of plastic to certain combinations of lacquer can turn the article into a glue-like mass in a short time. Coatings can migrate to the plastic, to each other, or both, or any combination of both," he said. He added that many plasticizers, solvents and bases have distinct migration tendencies.

"The danger here," he went on, "is that the migration can take place over the course of three or four months, and penetrate three or four inert layers of coating."

Mr. Ostock concluded his talk by pointing out that when working with cellulose acetate, vinyl, phenolics and certain other plastics, it is possible to use coatings that have a more versatile solvent base since crazing is not a problem.

"In phenolics," he said, "baking finishes are nearly always specified since the phenolic surface is actually superior to a lacquer finish in most respects. To achieve a good baking finish, however, high temperatures are necessary, which rules out this method for most thermoplastics. When talking about baking finishes, 250°F. is considered to be about the minimum temperature.

"Generally speaking," Mr. Ostock said, "the higher the temperature and the longer the cure, the better the finish."

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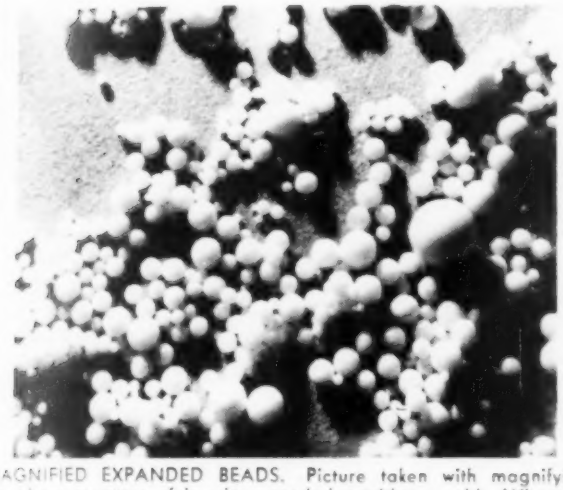
A Polystyrene Foam That Can Be Molded!

A new form of polystyrene is the expandable beads produced by Koppers Co. A white powder in the form of tiny beads, the material is expanded by temperatures of [illegible] C to foam pellets. Most interesting is the fact that the material may be molded to form items ranging from [illegible] pounds per cubic foot to about 5 pounds per cubic foot in weight. Suggested uses include the making of lightweight sandwich material, toys, insulation, advertising displays. For details write to Koppers Co., Inc., Chemical Div., Koppers Bldg., Pittsburgh, Pennsylvania and ask for bulletin C-4-200-T.

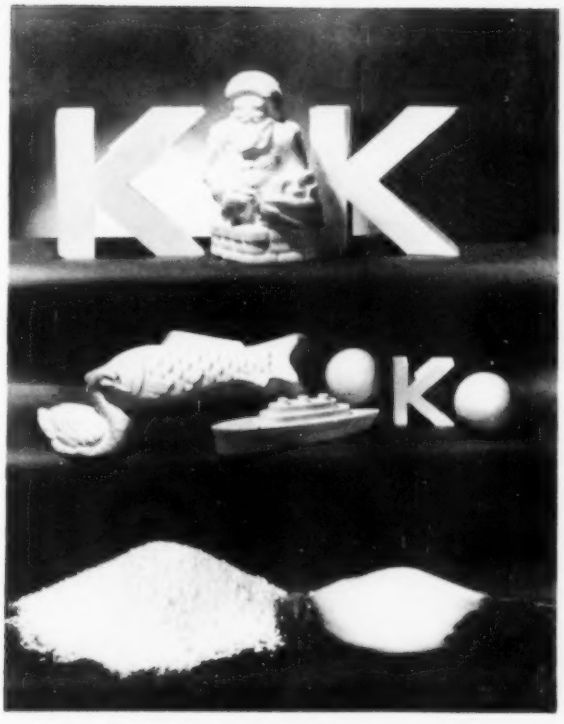


MAGNIFIED EXPANDED BEADS. Picture taken with magnifying lens shows structure of beads expanded outside a mold. When expanded in molds, the beads crush together and adhere to each other.

PROMISING POTENTIAL. Sandwich construction to combine lightness and strength is possible with Koppers new expandable plastic. Here pieces of the featherweight plastic are sandwiched between plywood (left) and aluminum (right). The plastic adheres readily to wood and metal.

Major price reductions of "KEL-F" fluorocarbon plastics that will have important impact on the chemical and electrical industries were announced by The M. W. Kellogg Company, leading producers of the product, as the annual Basic Materials Show opened at the International Amphitheater in Chicago.

These reductions — ranging from 22 to 42 per [illegible] were made possible by increased acceptance of "KEL-F" polymer.



STAGES OF PROCESSING. At right below, a pile of Koppers expandable polystyrene beads is shown. At left, the tiny beads have been "popped" into expanded spheres. Above are various items produced when the expandable polystyrene is heated in molds.

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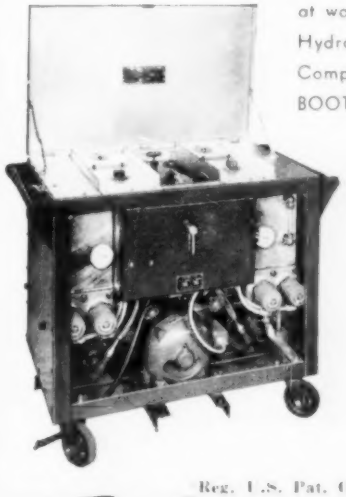

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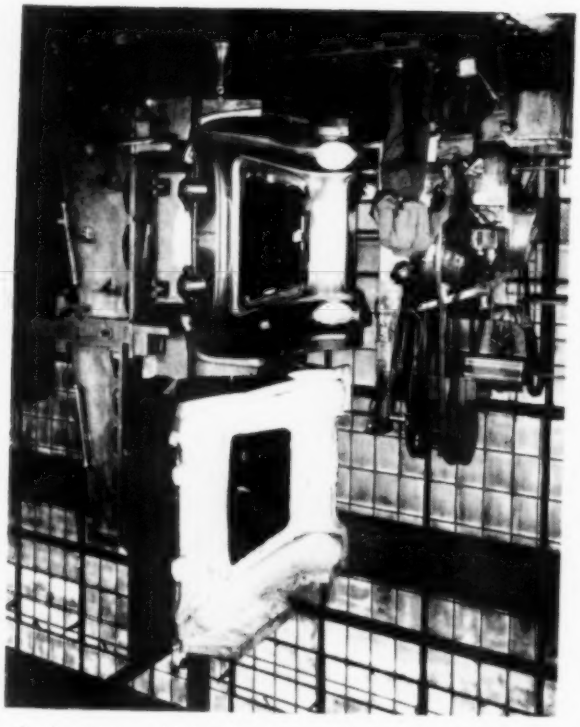

Fig. 1. A metal mold for the front section of the Corvette body is shown ready for final polishing touch.

Corvette Story

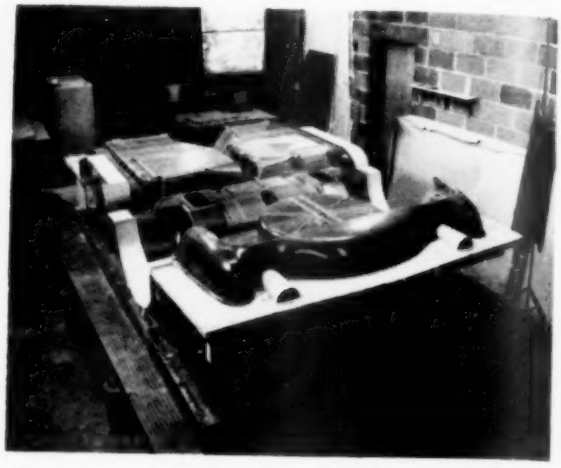

Fig. 2. Vacuum bag process starts with a mahogany wood mod

The story of the Chevrolet Corvette is a fascinating one. It is told in detail in "The Corvette Plastic Body" by E. J. Premo. The various means of laying-up and molding procedures are all described with photographs illustrating every step. This story was presented to the S.A.E. annual meeting in Detroit last January. A copy of the 2-page booklet may be had by writing to The Chevrolet Central Office, General Motors Bldg., Detroit 2, Michigan or to the Society of Automotive Engineers, 29 West 39th St., New York 18, New York.

The photos on this page are from Mr. Premo's paper.

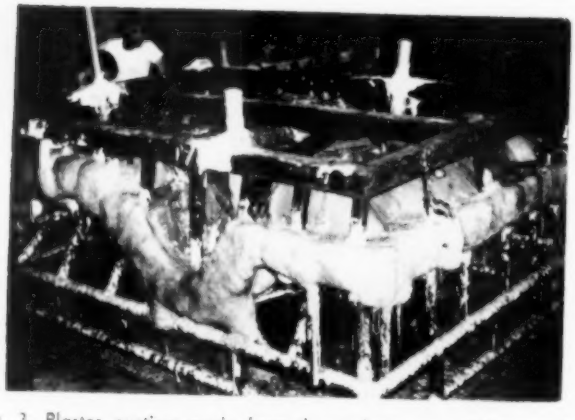

Fig. 3. Plaster casting made from the mahogany model is used to prepare final mold of phenolic.

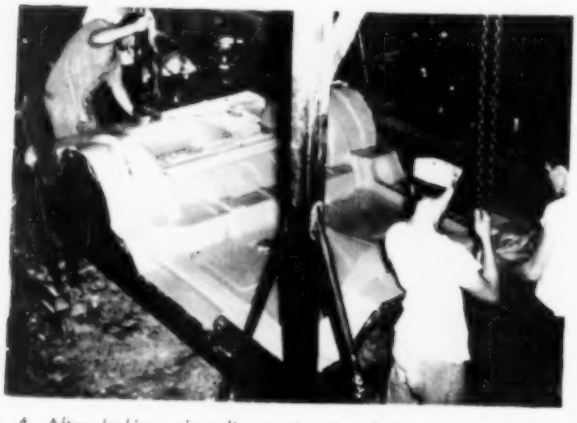

Fig. 4. After baking phenolic casting in plaster mold for from 12 to 24 hours, the plaster is chipped away and the mold cleaned.

Fig. 5. This is the final molded part which has been sent to the trim department where flash is removed and any defects sanded.

...tee on International ... Standards To Meet ... In England

At the invitation of the British Standards Institution, this year's meeting of Technical Committee 61 (Plastics) of the International Standards Organization will take place in London during the week of October 4th.

ISO is an international body whose members are the standards organizations of the participating countries. The function of ISO is to foster international trade by providing uniform specifications and standards for such properties of materials of commerce as dimensions, tolerances and tests for quality.

This work is carried forward for plastics by Technical Committee 61, the American Standards Association serving as the secretariat of this committee for the delegations from the twelve member nations. The United States delegation to TC61, headed by Robert Burns of Bell Telephone Laboratories, consists of experts in various fields of plastics, selected to represent the recognized plastics groups in this country, namely, the Society for the Plastics Industry, the Plastics Committee of the Manufacturing Chemists Association, the Society of Plastics Engineers, and the Plastics Committee of the American Society for Testing Materials.

The coming meeting will be the fourth. Previous meetings have been held in New York City, 1951, Turin, Italy, 1952, and Stockholm Sweden, last year. A report of the Stockholm meeting appears in Modern Plastics for October 1953, and in Standardization for December 1953.

Glass Hat Used For Mine Safety

Already in widespread use in industry, the recently introduced MSA Glass Fiber Hat developed by Mine Safety Appliances Company, Pittsburgh, is notable for its construction—high-pressure molded glass fiber—and for its physical characteristics and availability in color for job identification.

The Glass Fiber Hat combines high strength with light weight (14½ ozs.) and meets all government specifications for the drop, dielectric, burning rate, moisture and water absorption tests. Two shell sizes, for better fit with greater stability, comfort and safety, and a snap-in, adjustable lining, either leather or leatherette, make it suitable for head sizes from 6⅛ to 7⅞, inclusive.

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(continued from page 71)

The pattern of training for the plastics industry might well be:

Degree	Training For
I. Bachelor's Program (four years) in Chemical Engineering (one or two electives in plastics in senior year)	Position in operations, sales, applications, etc.
II. Professional Degree (a fifth year of study)	Design, Development, Processing, etc.
III. Master or Ph.D.	Research, Materials development, Teaching, etc.

The success of such a program will depend in greatest measure upon the quality of the staff primarily responsible for its operation. Well qualified staff in Chemical Engineering, solid state physics, economics, human relations, and so on, are usually available, but the staff in the specialized field of Plastics Engineering must be assumed, along with the strong support and continued cooperation of the industry.

I have read with strong interest the program for Professional Engineering Education in Plastics which was prepared by your Educational Committee under the leadership of Dr. Louis F. Rahm of Princeton University. I have further followed with interest the papers and reports of Mr. R. C. Bartlett dealing with the plastics industry's interest in education of plastics engineers. I know these publications are the result of many hours of deliberation, study, and work. These gentlemen, as well as the Educational Committee as a whole, are to be commended for the development of a forward-looking program.

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Chemistry of High Polymers	3	
Properties of Plastics	3	
Dielectrics & Insulating Materials	0	
Chemical Engr. of Synthetic Resins	3	
Plastics Engineering and Design	0	
Electives	3	
	15	15

My comments are basically in agreement with these suggestions as to an undergraduate program of study. I put greater faith, however, in a fifth-year program of specialized study to provide training for the hoped-for plastics engineer that is indicated by the industry's comments.

I feel sure the continued effective work of your organization's Educational Committee and the dynamic action and support of the industry will, in the not too distant future, develop a total college training program which will be flexible enough to prepare the student for the assumption of his professional responsibilities, to have an appreciation of human problems, and to provoke a consciousness of historical and world-wide perspective — that is the preparation needed for tomorrow's leaders of the plastics industry.

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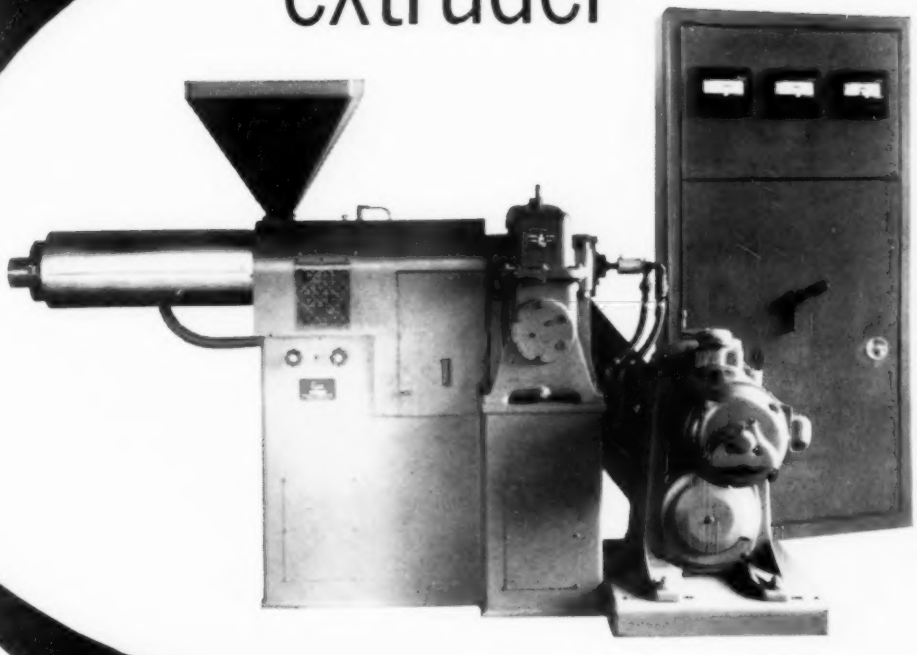

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